PRICE 50 CENTS

SEPTEMBER 14, 1953

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

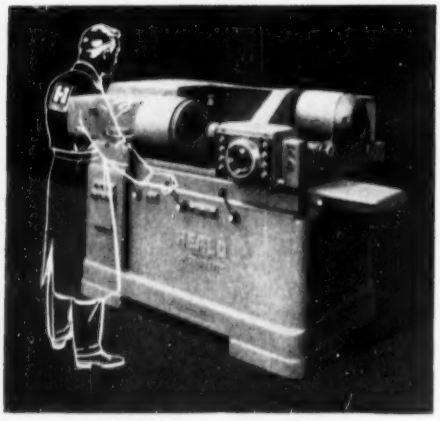
Industrial Diamond Lil—see page 2

Survey of Mist Coolants—A SPECIAL REPORT

Dimensional Stability in Gages

Vacuum Forming of Plastic

Heald Internal outproduces older equipment by nearly



This Heald Model 271 Gage-Matic grinds ring gear bores nearly as fast as two older machines.

THIS might be just another case history, except for one thing — a production increase of almost 100 per cent. And that's a pretty important saving in any production man's language.

A Heald Model 271 Gage-Matic was installed by an automotive manufacturer for grinding the bore of differential ring gears. A simple, straightforward operation — yet it was found that this new Internal out-produced *two* older machines by almost two-to-one! Why? Because all of the new Heald machines have been designed to save time and effort on *every phase* of the operating cycle. It all adds up to a substantial increase in production efficiency.

Remember — when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary
Surface Grinding Machines
and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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NUMBER OF COPIES PRINTED THIS ISSUE 35,165

chips

DIAMOND LIL . . . Our cover pictures an unusual occupation in Metalworking. The lady at the scales is sorting, weighing, and dispensing diamonds. All the jars in front of her are full of them, and they pass her eye at the rate of 10,000 carats a month—more than the average jeweler handles in a lifetime. Of course, these are industrial diamonds, and worth only about $2.70 a carat, but that's up plenty from the pre-Korean figure of 52 cents. "Diamond Lil" is really Mrs Marie Downing, who for the past ten years has been diamond boss at Carboloy. The diamonds are of course used in shaping carbides and the dust is reclaimed. But only 8% is recovered.

STABILITY . . . Lt Cdr Dubyk of the Naval Gun Factory explains how and why gages change dimensions in our lead article. He goes on to show procedures used at the Naval Gun Factory and in Europe for preventing such changes.

GRINDING . . . This issue includes two articles on grinding. First, M A Bergson of DoALL points out that half of grinding troubles come from poor truing and dressing of the wheel, although the machine is usually blamed. He goes on to tell how to do the job right. Also, two men from the Jet Section at Avco explain their method of determining costs and location of all tools during the grinding cycle.

MIST . . . Two years ago, we "broke" the idea of mist application of coolants. To bring the subject up to date, Associate Editor Brosheer make a comprehensive roundup in our current 16-page Special Report.

PRESSWORK . . . Maintaining our record for many, but short, articles to conserve your reading time, we have three stories on presswork, no two alike . . . Henry Gifford gives the story on tie rods and how to figure proper stress, plus the dangers of improper stressing . . . There's another instalment of Stanley Cope on draw-die design, plus a story on versatility in press brakes.

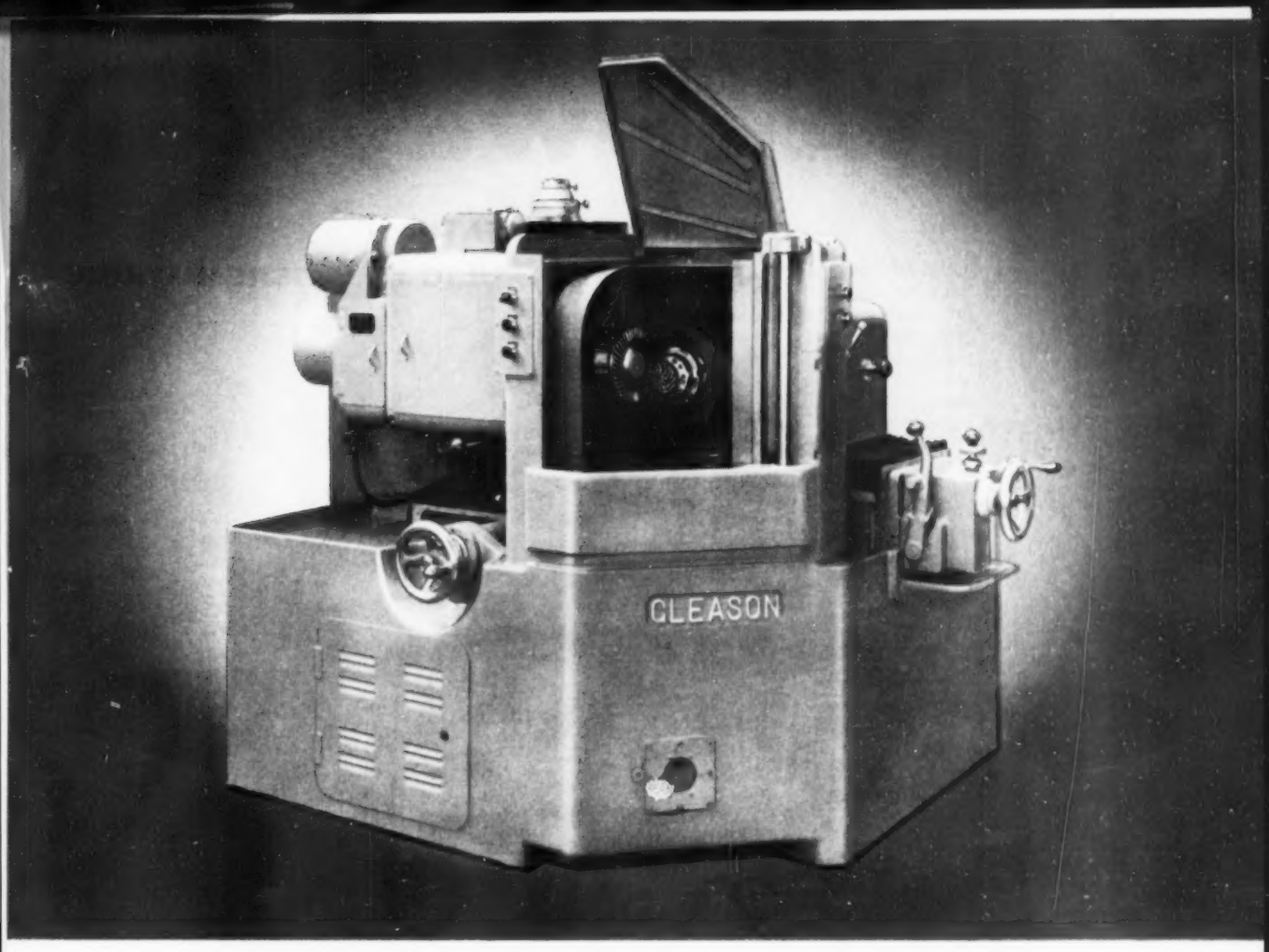
ULTRASONIC . . . So much has been said about ultrasonic soldering that we asked Les Walters to give us the story in simple terms. A consulting engineer, he shows how ultrasonic waves make possible the tinning and soldering of aluminum and other hard-to-solder metals.

SMART ONES . . . There's vacuum forming . . . Two other smart stories in this issue cover identification of unknown carbide blanks with a magnet and a jar of mercury, and warn of assuming too much from too little experimenting with our new friend titanium. Carroll Edgar, carbide engineer, of LaPointe, and John A Boyd, vice president of Van Stratten Chemical, are the authors.

COMING . . . Sept 28 *AM* will again give you a good assortment of exclusive data. Sam Storchheim is back to explain about crystal structure of metals in terms we can understand; we've put together a 5-source story on where high-rake and high-helix milling stand now, and there are articles on chip-handling at Studebaker, electrolytic grinding of carbide, oil fog on press dies, making rocket tubes at Rheem, and producing a steering part from metal powder.

BUTTON, BUTTON . . . Douglas Woodruff, Jr, did his bit in the Merchant Marine in World War II. Then he buckled down to work at Auburn Button Works, one of the oldest plastic molding concerns in America, and began a hard trek through all the various departments. Now, at 31, he is a vice-president, responsible for all research and production in the company's fast-growing extrusion and vacuum-forming division.

Taking little credit for himself, Mr Woodruff attributes the success of his operations to his creative team of young technicians who have developed unique production methods, that have made hitherto impossible extrusions and vacuum-formed parts a practical reality. Some of the secrets are laid bare for the first time in the six-page insert in this issue.



SPIRAL BEVEL AND HYPOID GEARS

Lapped faster, better than ever before

The new **No. 19 Hypoid Lapper** is simpler to set up, has greater productivity, and assures improved quality of lapped gears up to 17" diameter. Entirely new machine features include dial-operated controls, elimination of cam systems, and automatic positioning throughout entire lapping cycle.

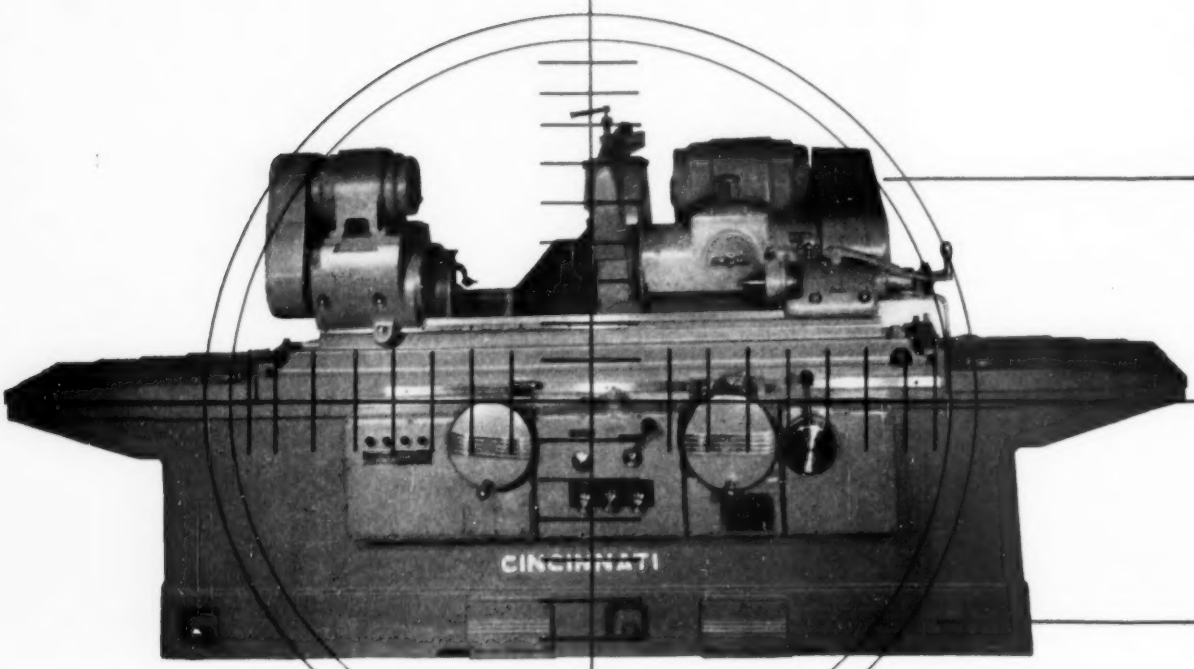
The No. 19 Hypoid Lapper is ideal for volume production or small quantities.

GLEASON WORKS

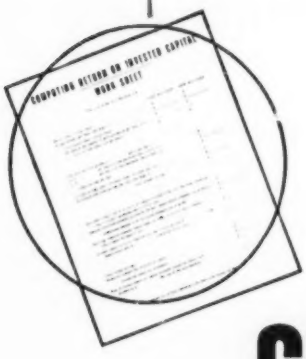
Rochester 3, New York

Any Way You

CINCINNATI FILMATIC
PLAIN HYDRAULIC GRINDERS REDUCE



CINCINNATI FILMATIC 10" x 36"
Plain Hydraulic Grinding Machine



FILMATIC

CINCINNATI

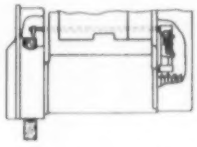
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES

Look at it

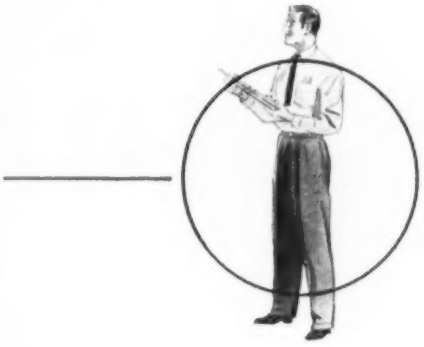
COSTS IN YOUR SHOP

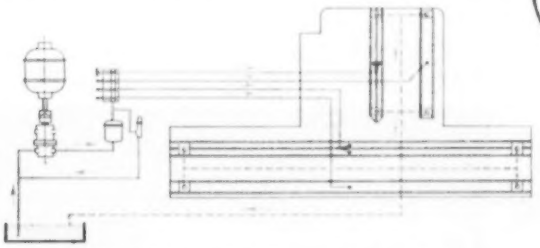
Look at the spindle bearings, the bed construction, lubrication of ways, electrical controls. Look at everything that effects efficient, low-cost production of precision centertype grinding, and you'll agree that CINCINNATI FILMATIC Plain Hydraulic Grinders have the potential to save a lot of money for your shop. A few ways in which the superior features of CINCINNATI FILMATICS keep costs at a minimum are illustrated here.

CINCINNATI'S exclusive FILMATIC bearings for the grinding wheel spindle require no adjustment; over 99% have never required service or maintenance.

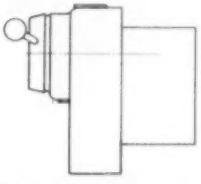


To minimize wheel cost, these machines are equipped with a two-speed device for the grinding wheel.

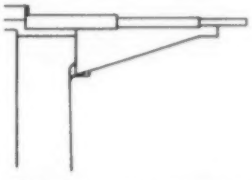




Automatic filtered lubrication of ways aids greatly in maintaining straight-line traverse and close accuracy for years.



Unit construction for principal hydraulic elements cuts maintenance expense.



Sliding covers protect the ways, reduce maintenance costs, increase life span.

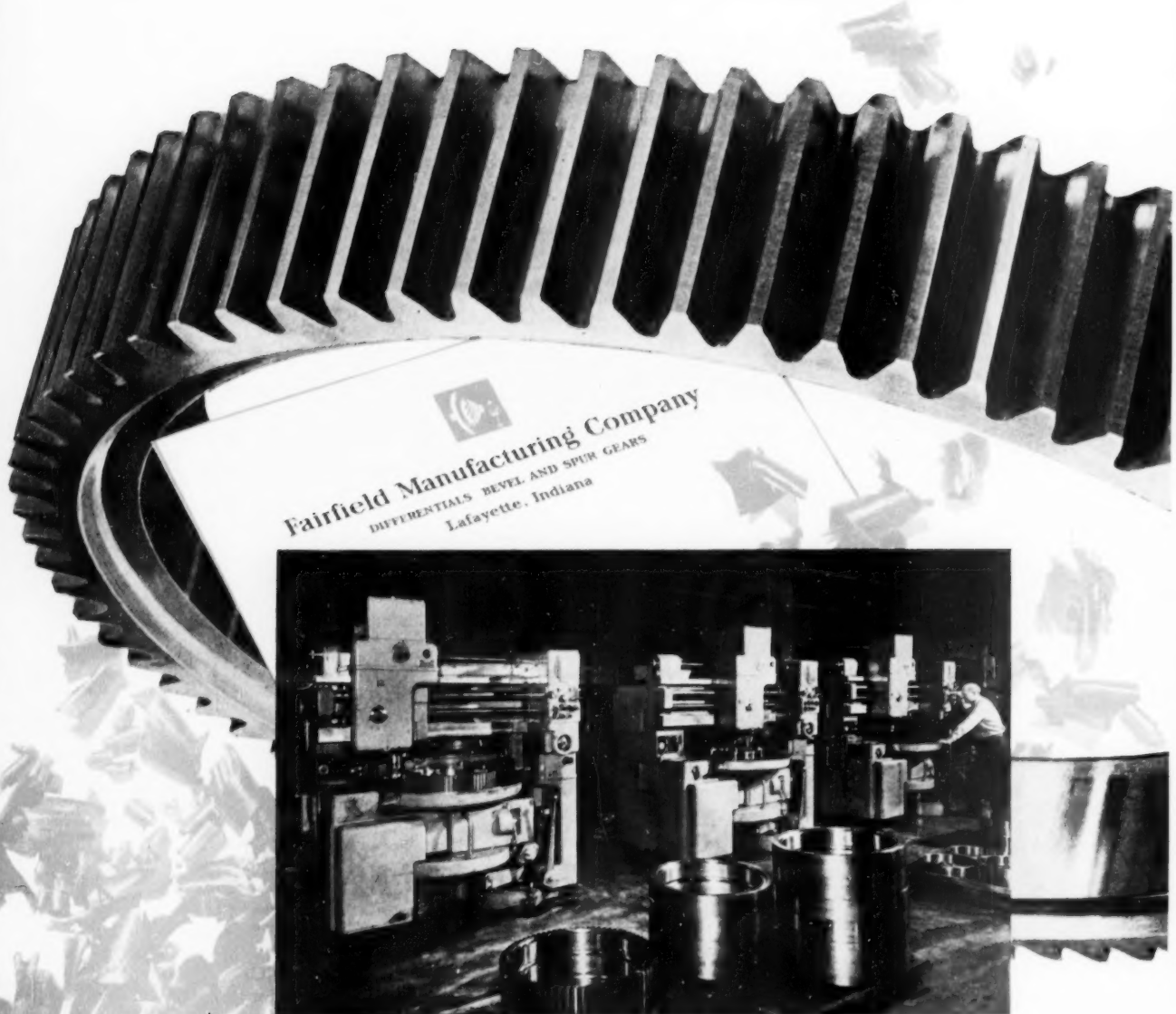
Any way you look at it, CINCINNATI FILMATIC Plain Hydraulic Grinders are the best buy for variety or production centertype grinding operations. It will pay you to replace your old grinders *now* with new CINCINNATIS. Brief specifications will be found in Sweet's Machine Tool Catalog. You may obtain complete data by writing for literature: No. G-566-2 for the 6" and 10"-L sizes; No. G-603 for the 10" and 14"-L sizes.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

HIGH-QUALITY GEARS . . . *and* 93



Fellows

cubic inches of

STOCK REMOVAL

PRODUCTION DATA
Pitch diameter 25.330"
Diametral pitch 3
Width of gear face 4"
Number of teeth 76
Cutter strokes per min. 86
Feed per stroke of cutter .0075"
Depth of roughing cut .640"
Depth of finishing cut .100"
Cutting time (2 cuts) (258 min.)

QUALITY gear jobs of broad variety gravitate to the 36-Type Fellows Gear Shaper — out in the Hoosier State as well as in others east, west, north and south.

It is our good fortune to be able to picture three 36's in the Fairfield Manufacturing Company's line-up of 26 Fellows machines in their plant at Lafayette, Indiana. With them, precision and controlled costs are paramount considerations, a fact well understood and appreciated by Fairfield's wide spread of customers.

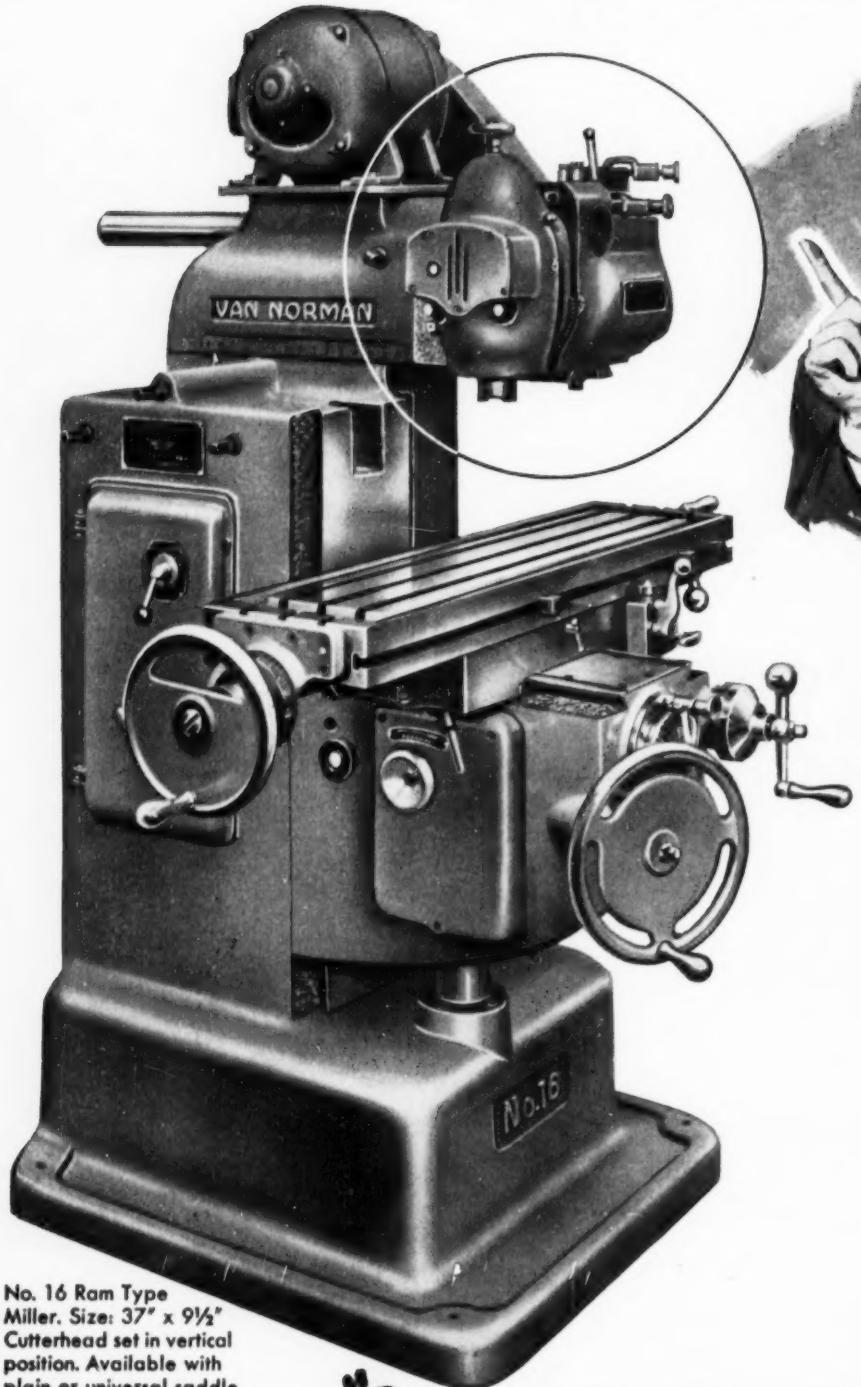
As typical of the fine work-planning (and machine performance) we give you the following report-in-detail about the heavy-duty gear being cut on the Gear Shaper nearest the camera. The gear is finished from the solid in two cuts, without a subsequent shaving operation. The blank weighs 156 pounds, and is of 4620 SAE steel. Roughing and finishing is done at the same setup, with the same Fellows cutter. Ninety-three cubic inches or 26 pounds of stock are removed—to produce fine-finish, high-quality gears.

If you aim to put quality into fine or coarse pitch gears, of dimensions best handled on a heavy-duty machine (this includes big coarse-pitch pinions, naturally), the Fellows "36" is something to investigate. » *Speeds and feeds quickly adjustable via shift-lever settings. Cutter stroke variable up to 6 inches. Mass rigidity throughout invites fast, heavy cuts.* » *The nearest Fellows office is your point of contact. Informative literature is available.*

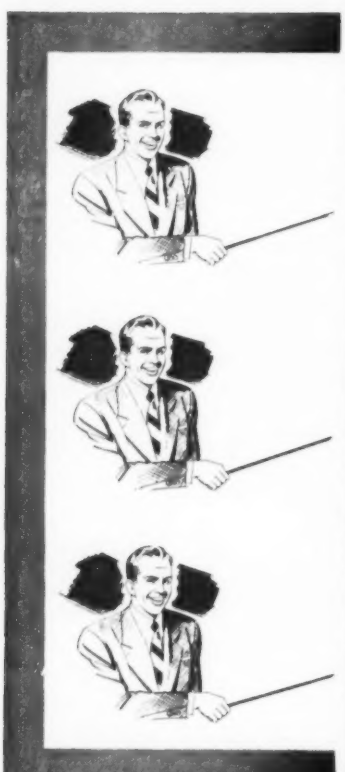
GEAR SHAPER COMPANY

Head Office & Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 323 Fisher Building, Detroit 2 • 5835 West North Ave., Chicago 39.
2206 Empire State Building, New York 1.

"See what the



No. 16 Ram Type Miller. Size: 37" x 9½" Cutterhead set in vertical position. Available with plain or universal saddle



"It pays to Van Normanize"

Adjustable Cutterhead

Can Do For You...

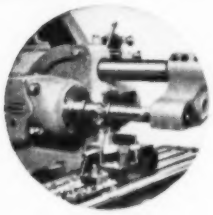
...and you will buy VAN NORMAN Ram Type Millers"

Van Norman Ram Type Millers give you every advantage for reducing milling costs. The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The movable ram plus the saddle cross feed increases the work range and capacity of these millers . . . enables you to handle larger work pieces with ease.

There is no waiting for single purpose machines because practically all milling operations can be accomplished on one Van Norman Ram Type Miller.

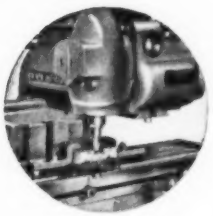
Whether it is for tool room, production line, machine shop, tool and die shop, or laboratory work, Van Norman Ram Type Millers will increase your production and cut costs.

Here's how one Van Norman Ram Type Miller does the work of three single-purpose machines.



HORIZONTAL MILLING

With the cutterhead locked in horizontal position, the Van Norman Ram Type Miller is used for horizontal milling operation. Hardened stop set at the factory assures positive 0° setting.



VERTICAL MILLING

The illustration above shows the Van Norman Ram Type Miller as it is used for a vertical milling operation. Permanently fixed hardened stop permits easy, accurate positioning of the cutterhead at 90°.

ANGULAR MILLING

Here the adjustable cutterhead is set at 45° angular milling position. Horizontal, vertical or angular milling. All are easily performed on the Van Norman Ram Type Miller.

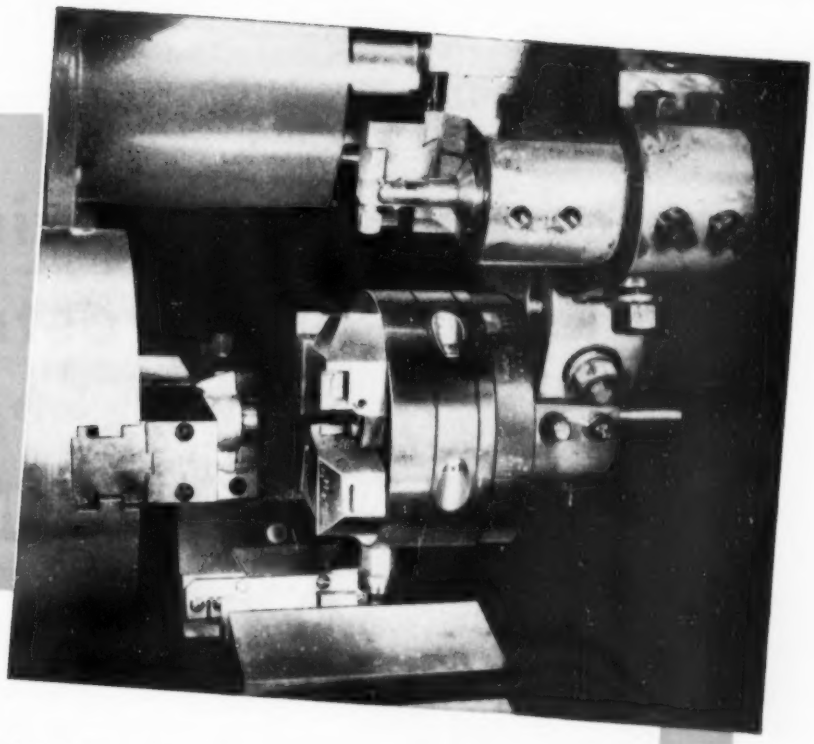
Van Norman Ram Type Millers are available in 6 basic models — No. 12, Table: 37½" x 9¼"; No. 16 Table: 37" x 9½"; No. 22L Table: 45" x 10"; No. 26 Table: 58" x 13"; No. 36 Table: 64" x 14"; No. 38 Table: 64" x 14".

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"AUTOMATIC THREADING"
Automatic Chucking
LANDIS
Machine
COMPANY
WAYNESBORO • PENNSYLVANIA
THE WORLD'S
LARGEST MANUFACTURERS OF THREAD

for Machines



The adaptability of Landis Heads is once again proven by this application of a LANDMATIC Head on a #1AC Warner & Swasey Automatic Chucking Machine. Normally, the LANDMATIC is applied to turret lathes and while self-opening, it is closed manually. To adapt this stationary head for automatic operation on the Automatic Chucking Machine, only two steps were required: (1)—the addition of a closing roller in place of the handle and (2)—the use of special closing pins which provide overtravel, eliminating the need of a complicated, accurately-set closing cam.

This adaptability has paid off for the S&C Electric Company, Chicago, Illinois, manufacturers of high voltage protective equipment.

Besides a completely automatic threading operation, this head, through the use of long life tangential chasers, offers lower tool cost and less down time. For example—when threading the workpiece shown, a contact ferrule of 85-5-5-5 cast red brass requiring a 1⅜"—16 Pitch UN thread ⅜" long into a 1/16" relief, complete runs of over 3000 pieces are made without grinding the chasers.

Another outstanding feature of LANDMATIC Heat-Treated Heads is their wide range coverage and oversize capacity. The 2" Head, illustrated here, will normally thread all diameters ranging from ⅜" to 2". Using oversize chaser holders, its range can be increased to thread up to 3¾" in diameter.

For more complete information on LANDIS Heat-Treated Heads for rotary or stationary applications, straight or tapered threading, ask for Bulletin F-90. Please send specifications when writing.

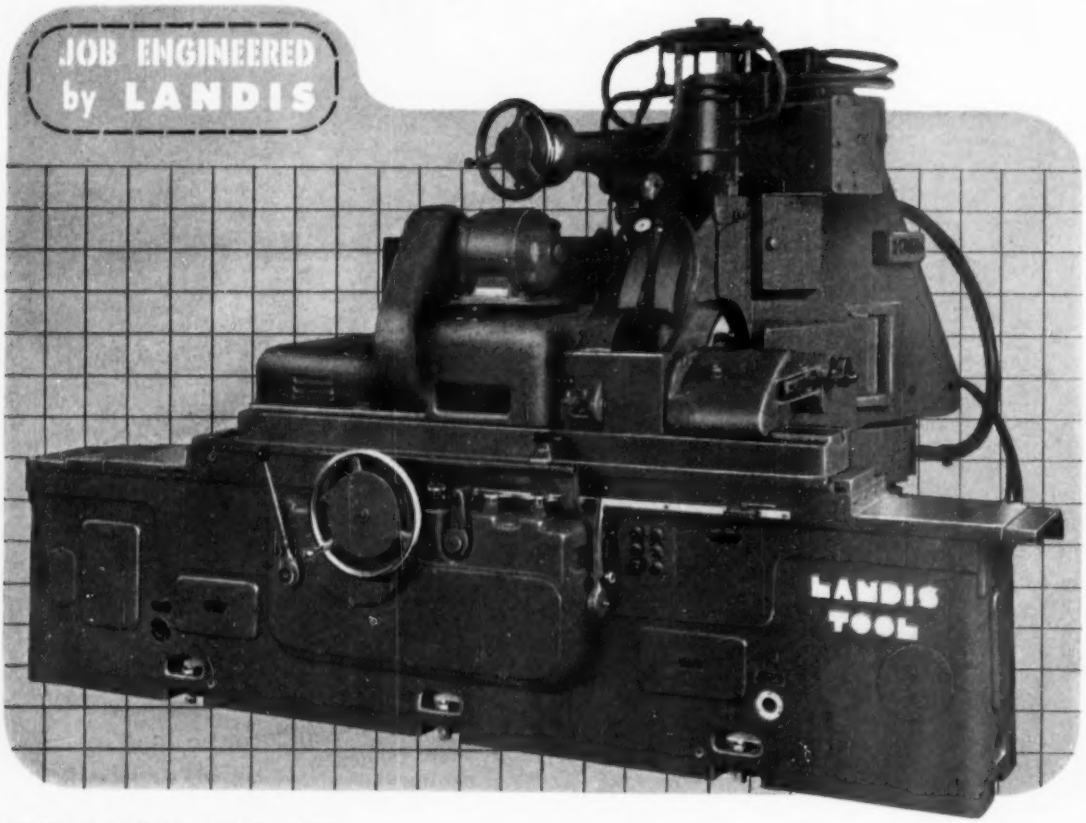
GENERATING

EQUIPMENT

How LANDIS JOB ENGINEERING cuts grinding costs...

Angle wheelbase grinder gives fast return on investment...

Grinds diameters and adjoining face in one operation



Landis 10" x 36" Type CH Plain Grinder with wheelbase set at 30°. Dresser is overhead type, hydraulically operated for profile dressing of wheel.

JOB ENGINEERED by LANDIS means grinding ideas that will produce the highest return on your investment —fast! It starts with operator convenience, hydraulic operation and simplified maintenance of a standard grinder. Then, on the basis of your requirements of finish, tolerance and production, we will suggest tooling such as these angle wheelbase jobs that will increase output with no loss in precision or finish.

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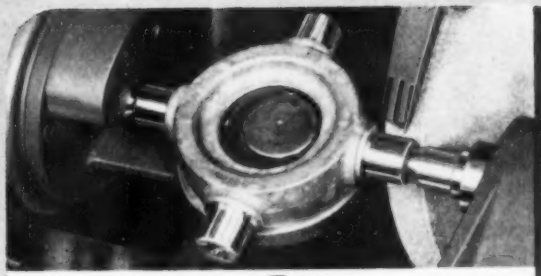
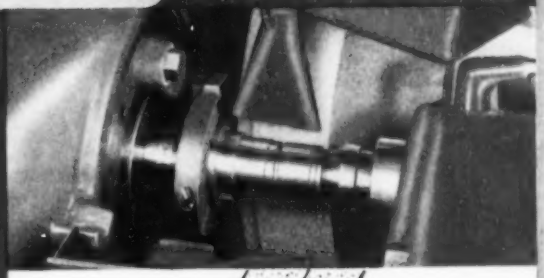
Landis Job Engineered Grinders give you fast return on your investment because they're engineered to your requirements. Send us your prints for tooling suggestions and production estimates. No obligation.

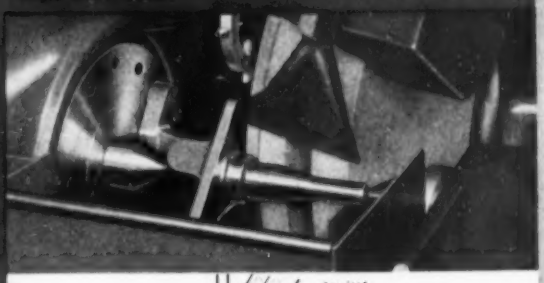
LANDIS

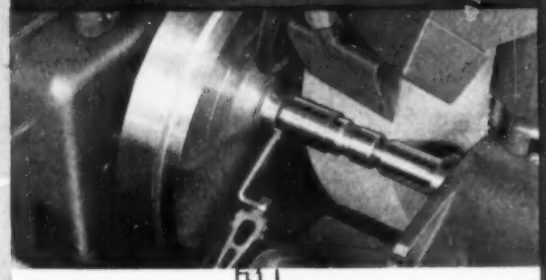
precision grinders

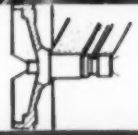
JOB ENGINEERED by LANDIS

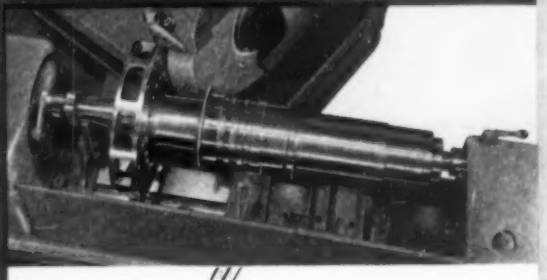


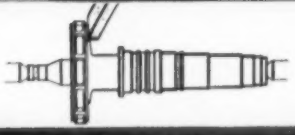












LANDIS TOOL COMPANY • WAYNESBORO, PENNSYLVANIA, U. S. A.

GIDDINGS&LEW
HYPRO

Photo courtesy of
TEMCO Aircraft Corporation
Dallas, Texas

Metal Surgeon...

with a flair for general practice

Performing with speed and precision this G & L Open Side Planer gives you a highly versatile tool to handle both common and uncommon work with equal efficiency

Productive flexibility . . . that's one of the many big advantages of using a G&L Planer such as this Hypro Open Side machine. Whether it's a simple or complex job . . . long or short run . . . big or small workpiece — this versatile machine completes it in minimum time with a minimum of setups.

Its openside construction allows you to handle workpieces up to 120 inches in width. Table lengths can be furnished in the proper size you need, and horsepowers range up to 100. Smooth, responsive control minimizes tool breakage, and outstanding rigidity allows holding tolerances within ten-thousandths.

For complete information on the G&L line of Open Side or Double Housing Planers, see your representative or write —

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

VK HIGH SPEED STEEL

THREAD MEASURING WIRES

...basic tools in a universally accepted method of checking screw threads

VK Set No. 20 HS Thread Measuring Wires, accurate to ±.000025" for 20 common pitch Unified and American screw threads, 6 to 36 threads per inch.

The three-wire method is probably the best known and most widely accepted system of measuring pitch diameter of screw threads. Equipment required includes only a set of VK Thread Measuring Wires of proper diameter and an accurate measuring instrument.

Van Keuren Thread Measuring Wires have been developed over a period of many years of pioneering in the precise measurement field. They are made to National Bureau of Standards specifications, are held within .00002" for roundness, straightness and identity and to within .000025" of exact size.

VK Thread Measuring Wires are made of long-wearing, tough and beautifully finished high speed steel and are either 1⅞" or 2" in length. Every wire is subjected to the closest criteria in today's standards of accuracy.

In addition to set No. 20, shown here, VK furnishes many other standard sets as well as special wires in diameters from .001" to 1.500."

The Van Keuren Catalog and Handbook No. 35 contains 91 pages of technical and engineering information on wire measurement of screw threads. This information, compiled from many years research in the field, is available without charge by addressing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

34th YEAR

THE Van Keuren CO.

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

HERE'S PROOF...

that LINK-BELT's Fluid Drive with constant CUSHION ACTION cuts machinery wear and tear

Cutaway shows simple, rugged construction of Link-Belt Fluid Drive.

Now you can use smaller motors and power transmission equipment on your toughest drive problems. What's more, both motors and driven machines will last longer with Link-Belt Fluid Drives.

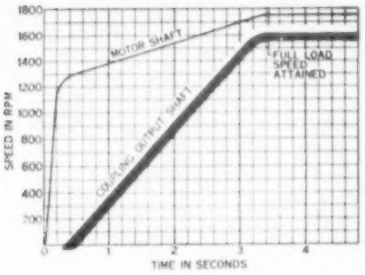
That's because constant CUSHION ACTION provides shock and overload protection . . . and at the same time eliminates high starting torque requirements and high starting currents.

Look at the three sets of curves shown here. See for yourself how constant CUSHION ACTION is the money-saving answer for loads of the high inertia, repetitive shock or high starting torque type.

For complete information, write for Book 2485. It shows how you can put five types of Link-Belt Fluid Drives to work in your plant: Electrofluid Drive, Electrofluid Gearmotor, Fluid Drive, Fluid Gear Drive and Fluid Coupling Drive. 12,853

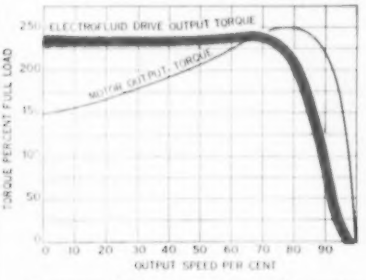
LINK-BELT
FLUID DRIVES

Smooth acceleration - -



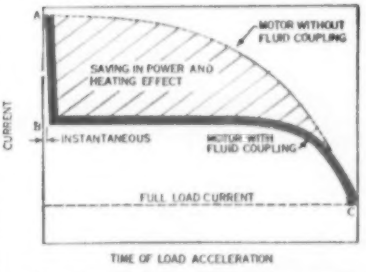
Typical motor and coupling acceleration curves for a high-inertia load show how CUSHION ACTION smoothly and gradually accelerates the load, saving wear and tear on vital equipment.

No overpowering - -



Compare the output torque of a motor with and without the fluid coupling. Because motor accelerates free of load, it reaches maximum pull-out torque that might otherwise require a special type of oversize motor.

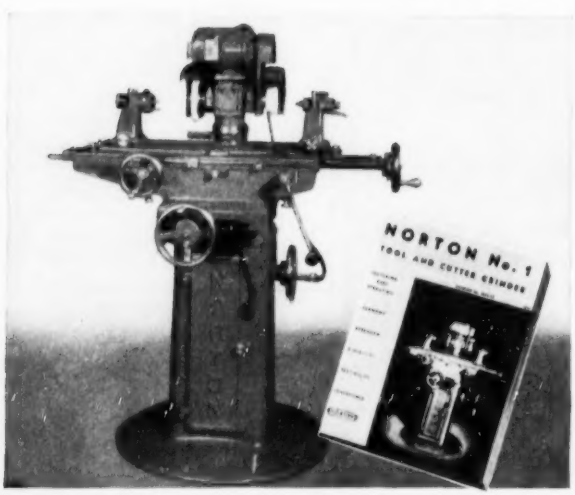
Low starting current - -



As these current consumption curves show, with the fluid coupling, motor starting current drops instantaneously to less than half the starting current required by a motor without fluid coupling. Difference represents power savings, reduced heating.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.

Fastest, most versatile of all cutter and tool grinders, the Norton No. 20, with tilting wheel head, brings the value-adding "Touch of Gold" to every piece of work it grinds.



Norton No. 1 tool and cutter grinder. Supplied in arrangements varying from a plain machine for sharpening cutters and reamers supported on centers only, to a universal machine for cutter, surface, cylindrical and internal grinding. Especially valuable for circular form tool grinding because of micrometrical feed screw for traversing work table. Catalog No. 1034.

Norton No. 2 hydraulic tool and cutter grinder. Designed for the widest range of tool room jobs. An outstanding feature is the smooth, hydraulic table traverse, ideal for wet or dry cylindrical operations, internal jobs or the grinding of long reamers and cutters more uniformly and easily. Catalog No. 858.

4 sure ways you can add the "TOUCH of GOLD" to your tool and cutter grinding

Norton grinders add value, cut costs over a wide range of jobs

Each of these four Norton tool and cutter grinders is designed to bring you these two major benefits:

1. **Accurate, efficient sharpening that assures longest possible tool life.**
2. **Dependable, economical operation that assures lowest possible grinding costs.**

That's the value-increasing, cost-cutting "Touch of Gold" you add every time a Norton grinding machine goes to work for you. For complete facts on how it can be brought to your own grinding, see your Norton Representative. Or write us direct for catalogs. And remember: only Norton offers you such long experience in both grinding wheels and machines. NORTON COMPANY, Worcester 6, Mass.

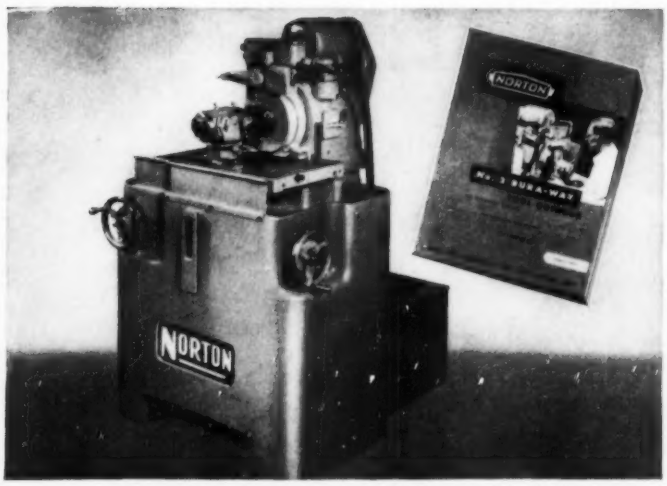
To Economize, Modernize With **NEW**

NORTON

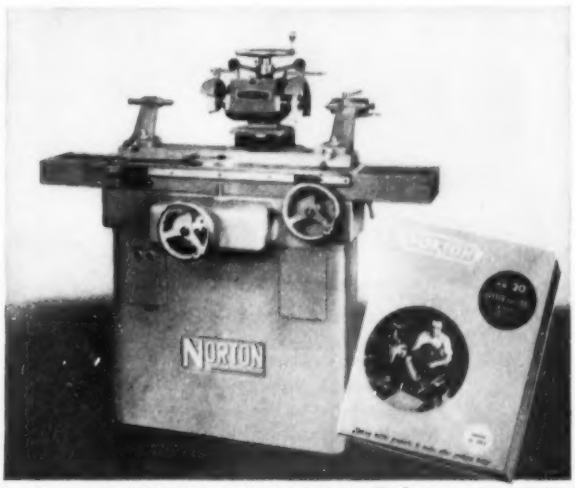
GRINDERS *and* LAPPERS

Making better products . . . to make other products better

District Sales Offices: Hartford • New York • Teterboro, N. J. • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5, Ontario



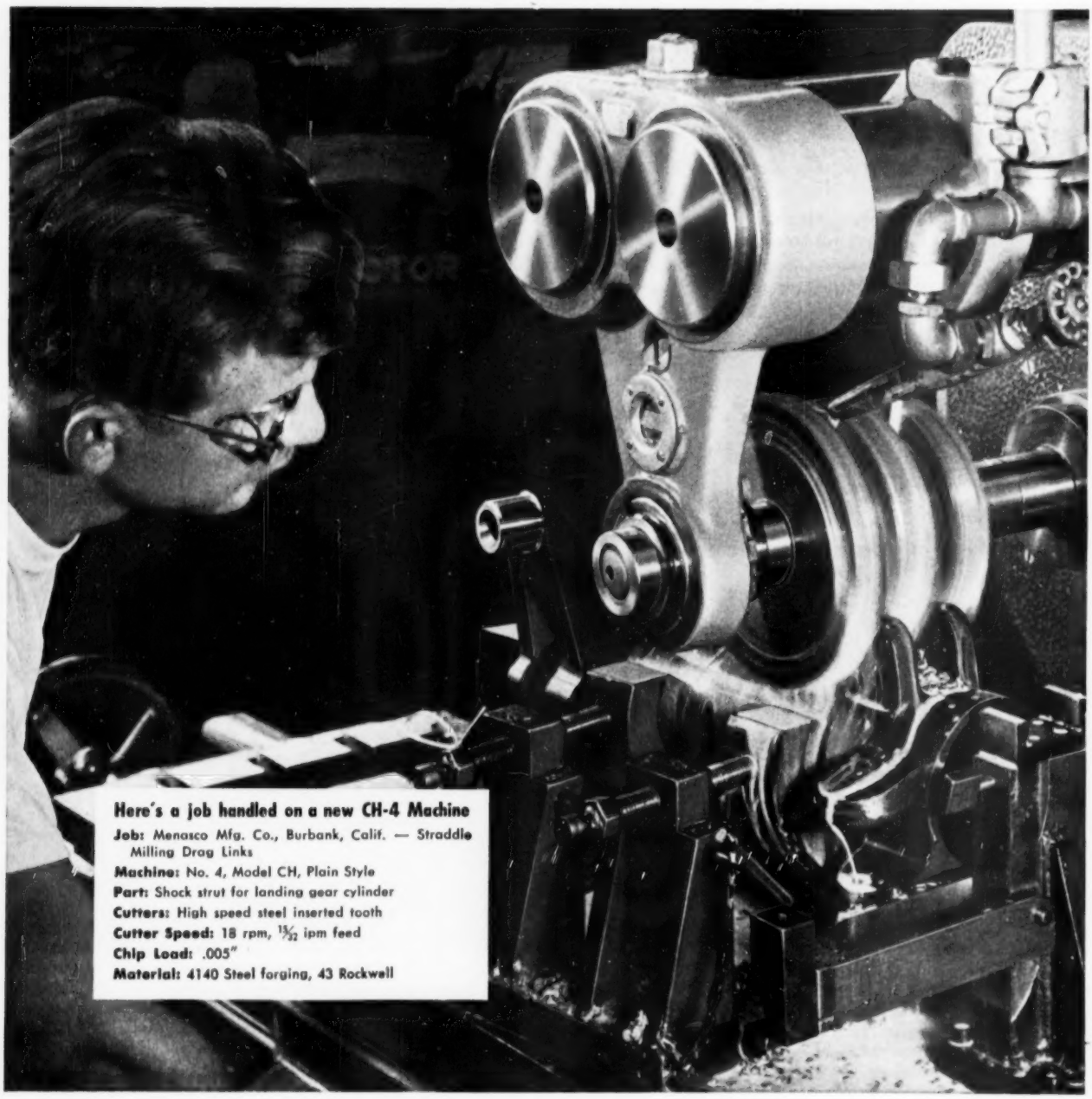
Norton No. 2 bura-way tool grinder. Provides the best method of grinding convex single point and form tools, because it generates, reproduces and maintains relief angles constant in the direction of the feed. Insures exact duplicates of the master tool form. Helps extend the life of carbide-tipped and other tools considerably. Catalog No. 220.



Norton No. 20 cutter and tool grinder. Easier to set up, operate and maintain, this versatile grinding machine handles many tool room jobs quickly and economically. The wheel head can be tilted up to 15° above or below horizontal and swivelled through 360°, simplifying ordinarily difficult applications. Catalog No. 189.

KEARNEY & TRECKER MILWAUKEE

CH MILLING SPEED, ACCURACY



Here's a job handled on a new CH-4 Machine

Job: Menasco Mfg. Co., Burbank, Calif. — Straddle Milling Drag Links

Machine: No. 4, Model CH, Plain Style

Part: Shock strut for landing gear cylinder

Cutters: High speed steel inserted tooth

Cutter Speed: 18 rpm, $1\frac{5}{32}$ ipm feed

Chip Load: .005"

Material: 4140 Steel forging, 43 Rockwell

MACHINE COMBINES AND POWER

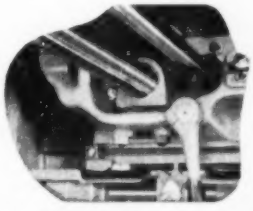
CH MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

Speed range—*24* speed changes are provided from *15* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.

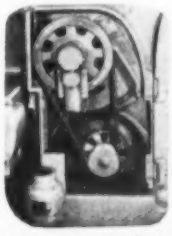
Extra wide feed range — *32* changes from ⅜" to *90"* per minute meet requirements of new metals and cutting tools for most efficient operation.

Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.

Greater cutting efficiency through design refinements and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed for quiet operation.



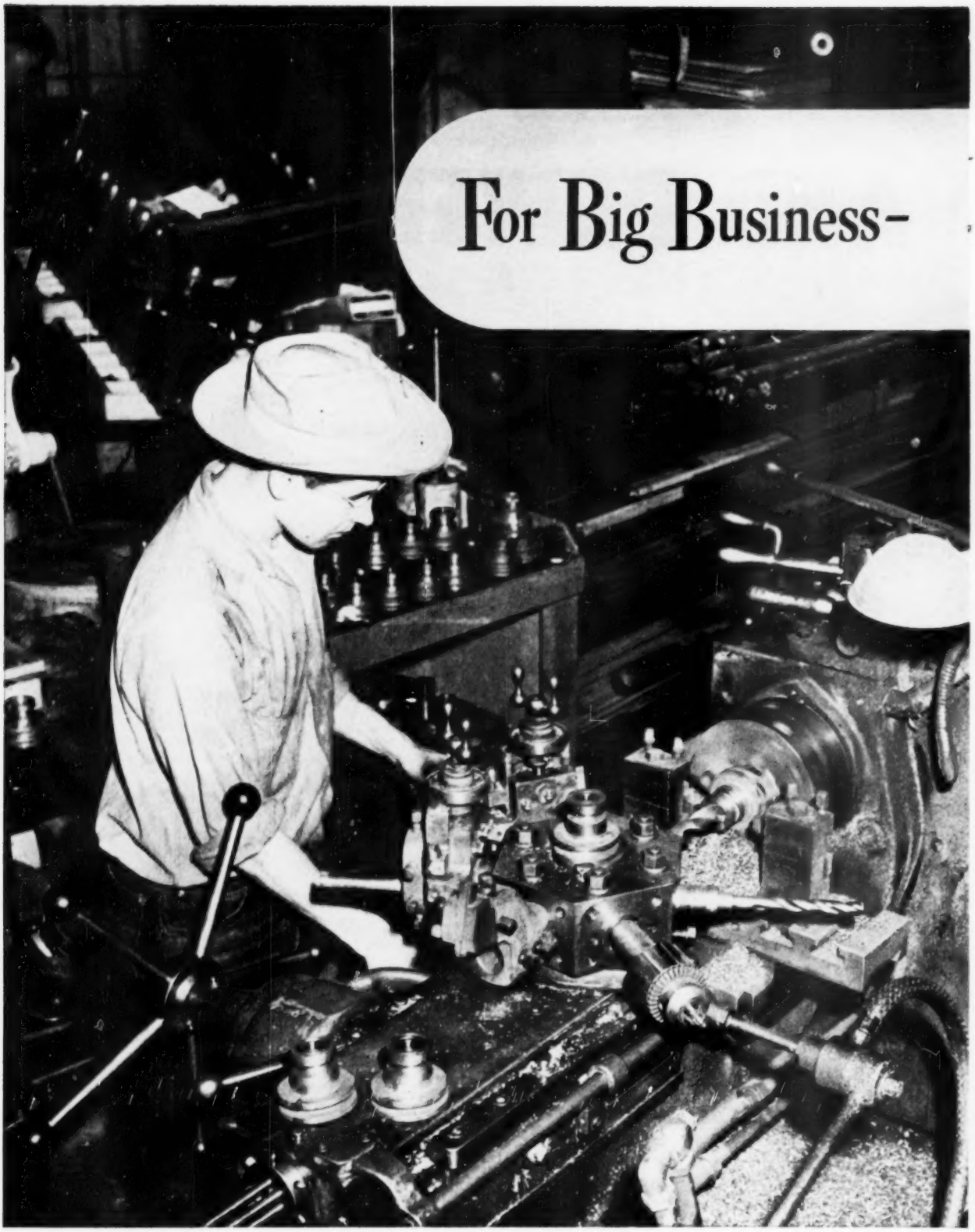
Smoother feed performance through a heavy duty *2"* dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.



Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 15 hp delivered to spindle . . . *3* hp for feed and rapid traverse . . . ¼ hp for coolant.

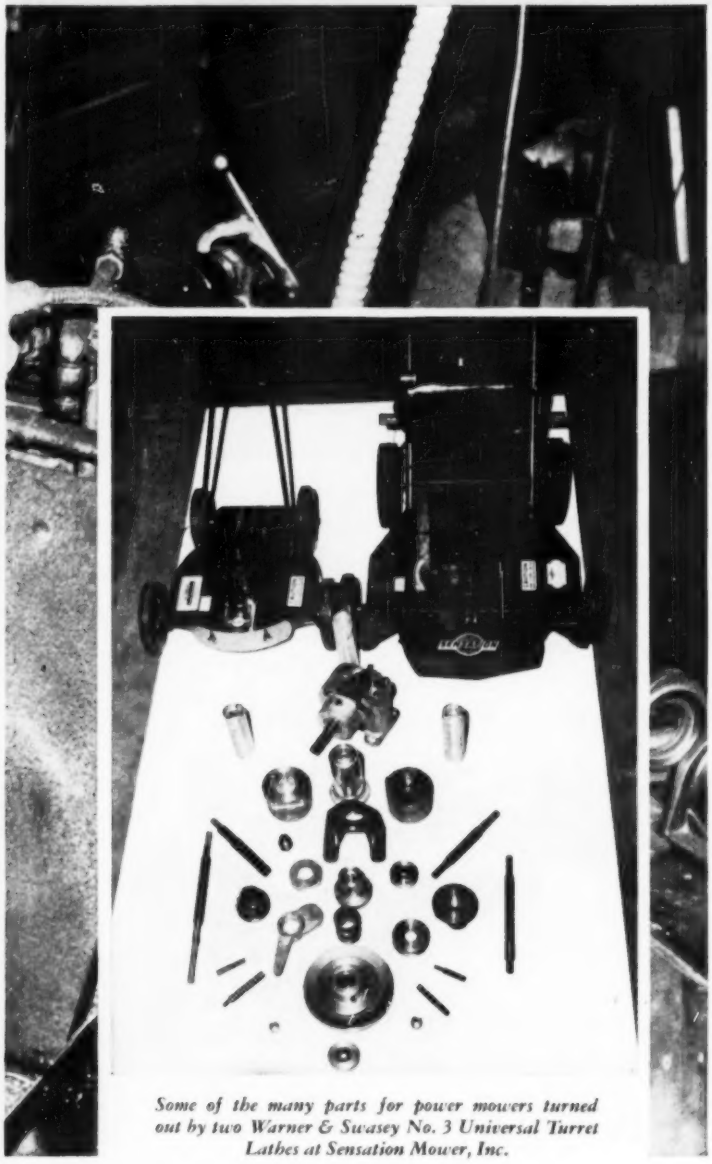
INVESTIGATE the new CH line of milling machines. These and other features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

SURE...*and Small Business, too!*



Some of the many parts for power mowers turned out by two Warner & Swasey No. 3 Universal Turret Lathes at Sensation Mower, Inc.

SENSATION MOWER, INC., Ralston, Nebraska, is not a high production shop in terms of metalworking plants. But this relatively young company, using only two Warner & Swasey No. 3 Universal Turret Lathes for their entire metal turning needs, was able to compete effectively and grow in the power lawn mower field.

The two Warner & Swaseys give Sensation Mower the versatility they need to produce over 40 different parts for mowers. They also turn out parts for newer lines of snow removal equipment and power floor polishers. The Warner & Swaseys' versatility has even enabled the company to take on sub-contract work during their "off-season".

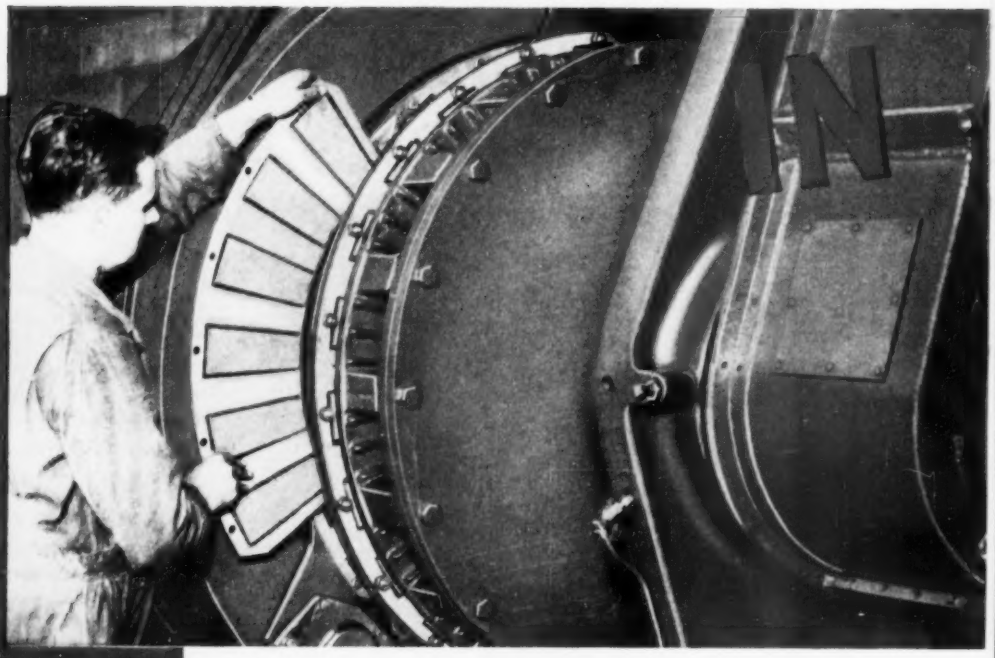
Both machines have had a total of *only one day's downtime* since their installation in 1946!

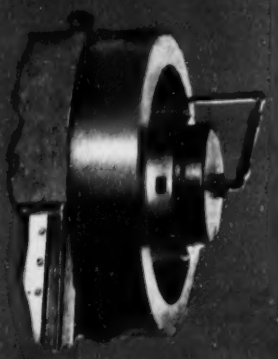
You can count on this kind of highly versatile, dependable production with Warner & Swasey Turret Lathes—money-makers whether you're a small manufacturer or in business in a "big" way!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

BLISS has the "right" design



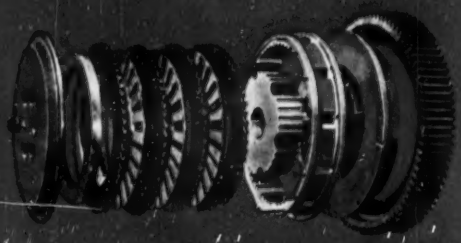


Type "K" Friction Clutch

FOR MEDIUM SIZE AND LARGER PRESSES. Highly compact brake and clutch unit. Cool-running, dependable and self-aligning. Friction plates are removable without disassembling clutch.

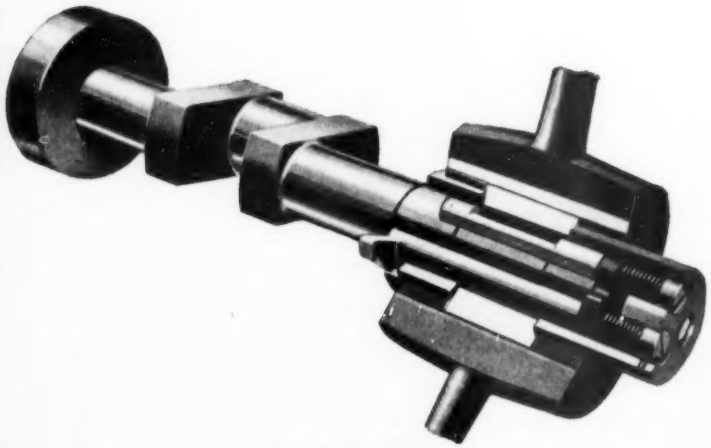
Type "O" Friction Clutch

FOR INSTALLATION ON PRESS CRANKSHAFT. Provides fast action when working hot metal — helps avoid annealing. Operates perfectly under difficult conditions.



Type "P" Friction Clutch

FOR FORGING PRESSES AND HEAVY DUTY MACHINERY. A high torque multiple-disc unit that provides the extreme in clutch capacity. It requires no adjustments.



Rolling Key Clutch

FOR PRESSES UP TO 100 TONS CAPACITY. The all-purpose positive clutch, considered by thousands of users to be the finest positive clutch available. Equipped with "oilless" bearings.

PRESS CLUTCHES

for each type press

EXPERIENCE PROVES — no one clutch is right for *all* presses. Uninterrupted press output and operator safety depend on the action, reliability and easy maintenance of a clutch. That's why Bliss engineers, drawing upon a century of experience, have developed a variety of clutches to meet many different press needs.

Whether a press is large or small, flywheel or geared, open or closed, fast or slow, continuous or intermittent in operation, you can be sure every Bliss press has the "right" clutch to fit its particular operating requirements.

If you are experiencing clutch troubles — or if you are looking for improved clutch performance from new equipment — call for a Bliss engineer. He will quickly spot your trouble and make practical recommendations.

BLISS on your *clutch* is more than a name... *it's a guarantee*

E. W. BLISS COMPANY, Canton, Ohio

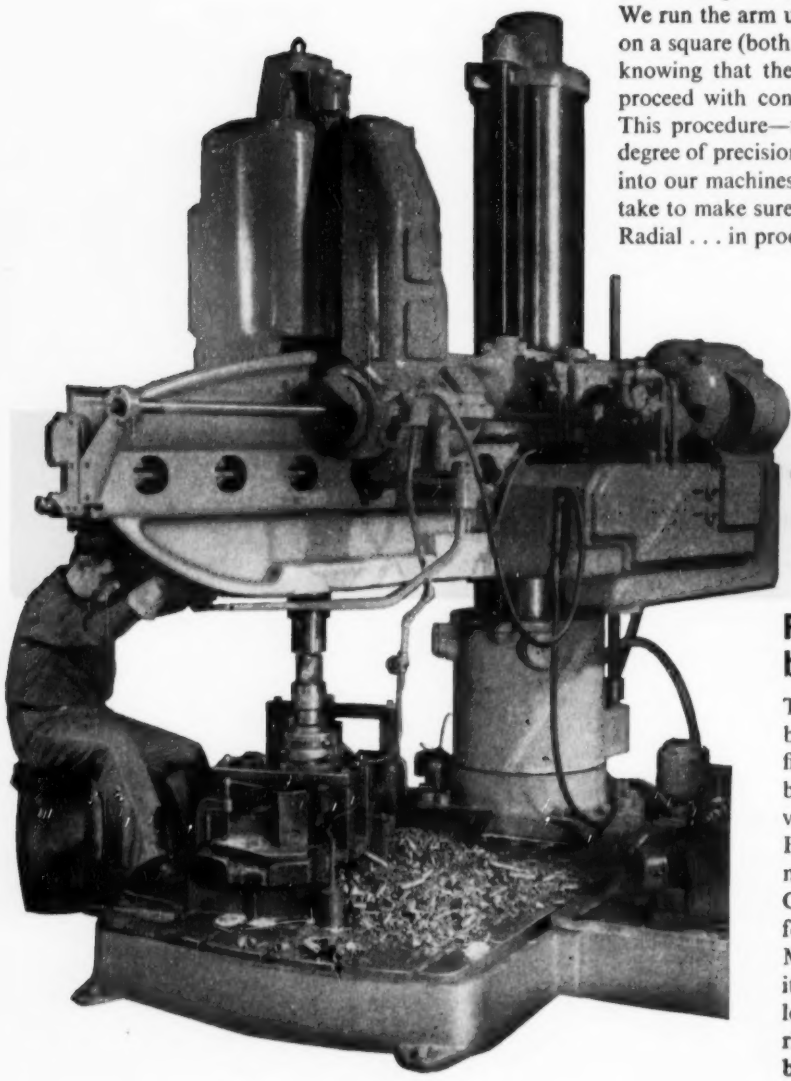
PRESSES, ROLLING MILLS, SPECIAL MACHINERY

E. W. Bliss (England) Ltd., Derby, England • E. W. Bliss Company (Paris), St. Ouen sur Seine, France

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other representatives throughout the world.

Here's another reason it pays to get a proposal from Fosdick

Fosdick aligns the column



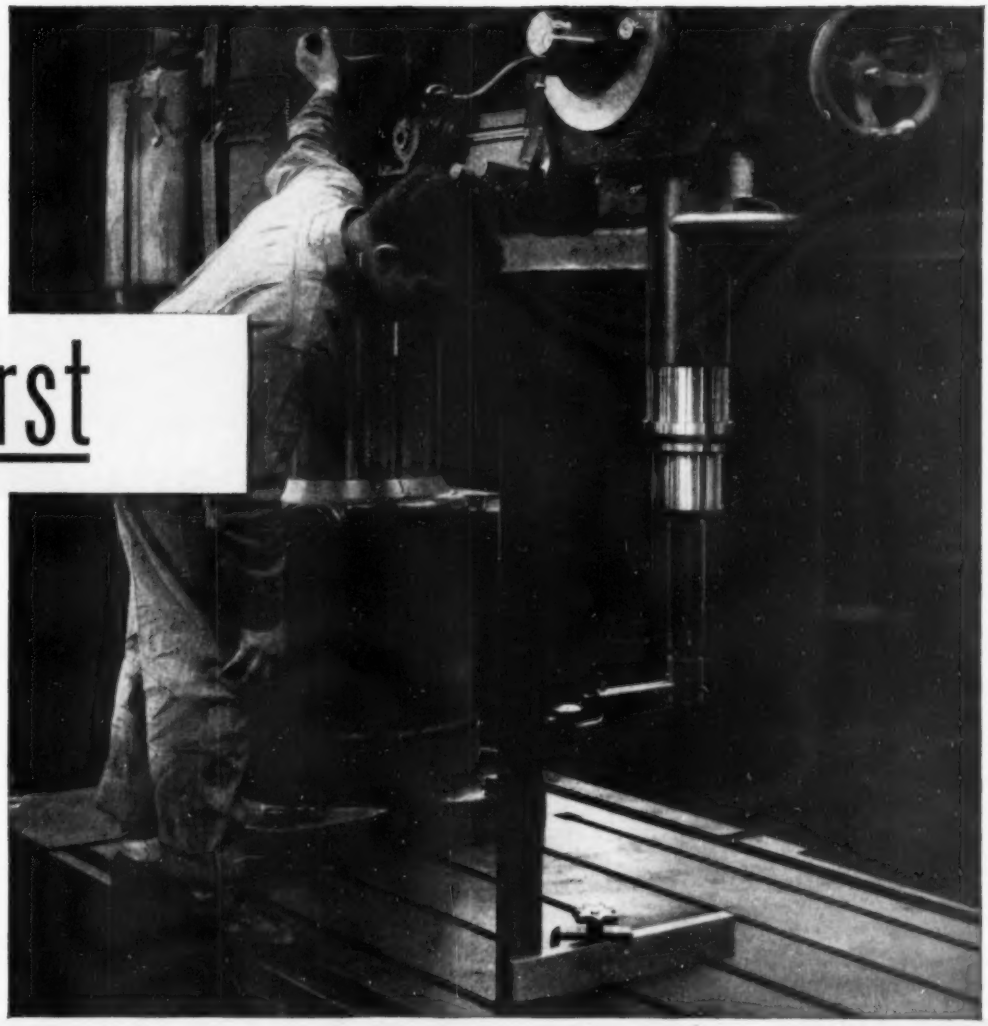
Radial alignment at Fosdick starts with the column. We run the arm up and down with an indicator bearing on a square (both lengthwise and across the base). Then, knowing that the column is square with the base, we proceed with conventional tramming and sweep tests. This procedure—used only by Fosdick—adds an *extra* degree of precision to the extra rigidity we have designed into our machines. It's another example of the pains we take to make sure you get the most out of your Fosdick Radial . . . in production, tool life, finish, tolerance.

Fosdick Hydraulic Radials are available with 3' to 8' arms, 11" to 19" columns. For full information, ask for Bulletin HRA.

to give you

Fosdick takes a "bite" out of boring time at Owen Bucket

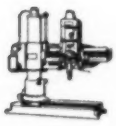
Tough cast-steel hinges for clamshell buckets are bored to ± .001" for a press-fit cast iron bushing—then counter-bored for a washer. For this and a variety of other heavy-duty drilling, Fosdick's proposal on a 5' 17" Radial made sense. Now Owen Bucket Co. of Cleveland gets 10 pieces in the time formerly needed to produce 7. As Frank Matisak, General Superintendent puts it, " . . . now we can do more pieces with longer tool life—this machine is more rigid, giving us closer tolerances and better finish."



First

precision production like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers

Sensitive and Upright Drills

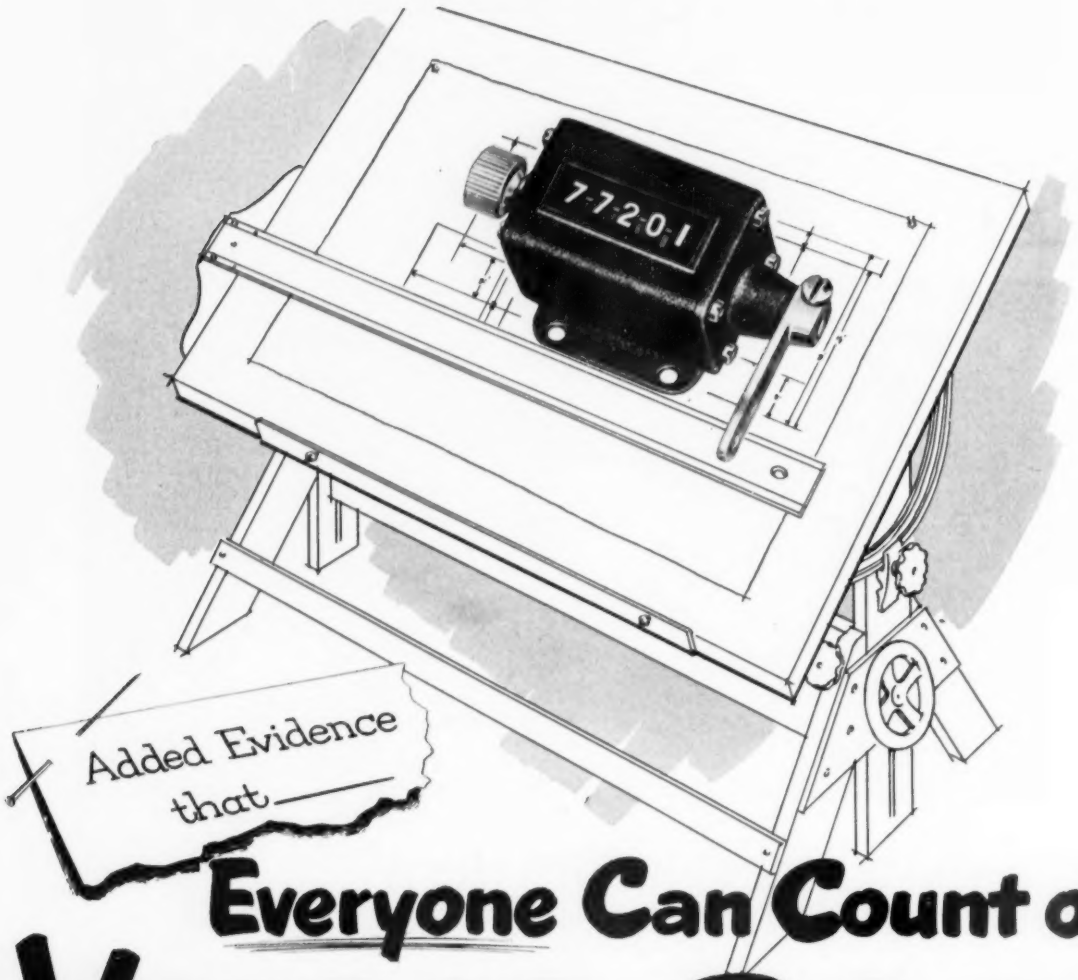
Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Nothing You Build Into Your Product *Can Count for More!*



Added Evidence that—

Everyone Can Count on VEEDER-ROOT

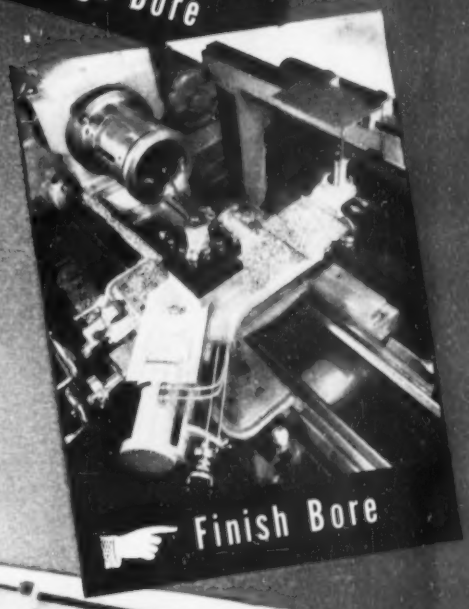
This compact Reset Counter, shown actual size, is a standard built-in part of many makes of business machines, cameras, coin machines, compressors, die casting machines, hay balers, laundry equipment, plastic molding machines, punch presses, shoe machines . . . and what have *you*? It counts turns, strokes, pieces or other units of performance and output . . . supplying facts-in-figures that help toward closer *Count*rol. Find out how *your* product can give your customers a *new usefulness*, with these or other Veeder-Root Counters for mechanical or electrical operation. Write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT
Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"The Name that Counts"

SUSPENSION BEARINGS at

a fraction of their former cost!



Total floor to floor time for Duplicating Lathe operations 52 minutes

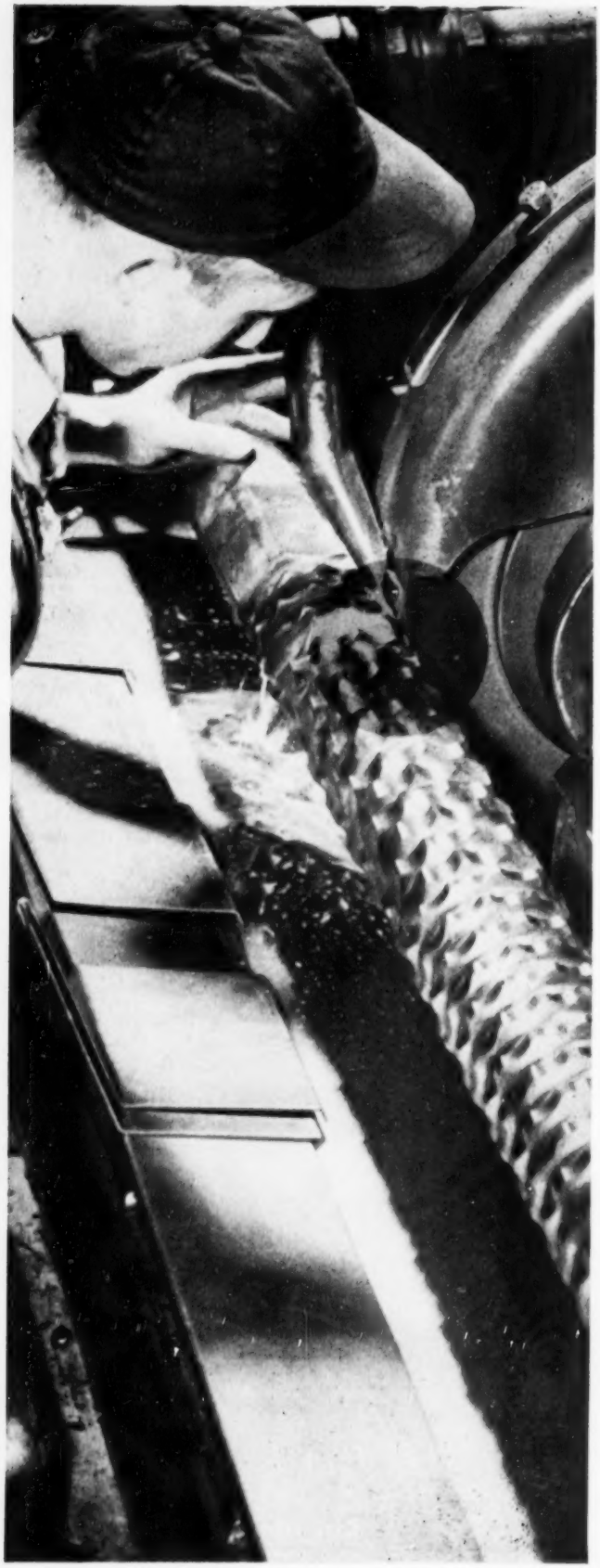
The technique and production time used in this text were taken from actual performance in two of the nation's leading railroad shops.

A complete time study including all pertinent data is available upon request.

This is only one of the Diesel engine component jobs that "American" Hydraulic Duplicating Lathes are performing at record low cost in many of our leading railroad shops. Never has the need for economies in railroad operation been more urgent. Never has there been a better opportunity for effecting economies in the railroad shop than offered by the "American" Hydraulic Duplicating Lathe.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



PROOF that O.D. grinding gets the "TOUCH of GOLD" with Norton G BOND wheels

. . . "Gave more than three times as many pieces per dressing."

. . . "Requires less truing and lasts 30 per cent longer."

. . . "Free cutting, excellent finish, considerably reduced grinding time."

. . . "Formed easily, held shape and removed .078" per plunge cut."

"Best Wheel Ever Used," reported by a user of Norton G Bond Wheels for cylindrical grinding, sums up the industry-wide verdict.

Reports like these are coming in fast from our O. D. grinding customers using Norton G Bond wheels. Throughout the entire range of cylindrical and centerless grinding jobs these new wheels are chalking up truly sensational records for more units per dressing, per hour and per wheel.

That's because the new G Bond, especially designed for precision and semi-precision grinding, is the most efficient vitrified bond ever developed. Wheels made with it are assured of constant, fresh, sharp cutting surfaces because of its unique ability to hold each abrasive grain *just long enough* for maximum cutting action.

Advantages That Pay Off

When you, too, try G Bond wheels you'll find they cut cooler . . . remove material faster . . . produce a better finish . . . produce more pieces per dressing . . . hold shape longer . . . and crush-true more easily. Then you'll know you've added the real production-boosting, cost-reducing "Touch of Gold" to every O. D. grinding job you do.

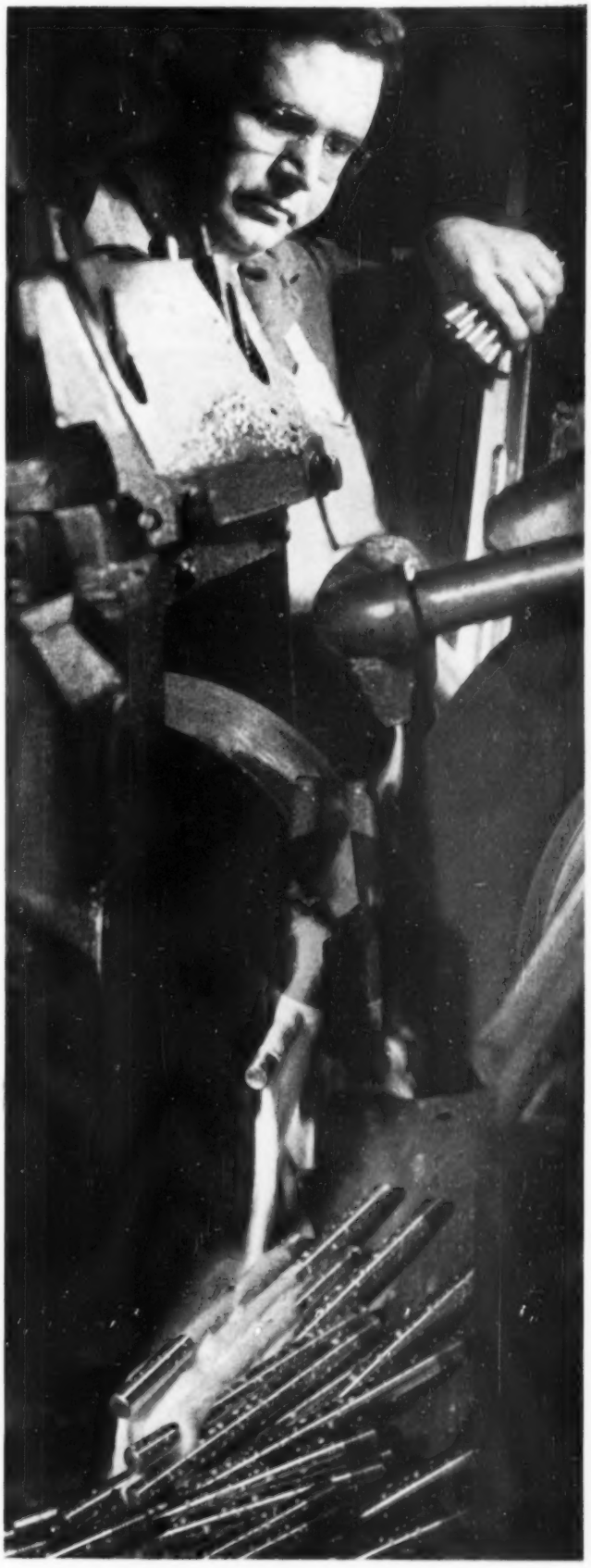
Ask Your Norton Distributor

for on-the-job proof of what G Bond wheels can do for your O. D. grinding. He'll gladly arrange a test in your plant. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities — listed under "Grinding Wheels" in your telephone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1510

NORTON
ABRASIVES

Making better products...
to make other products better

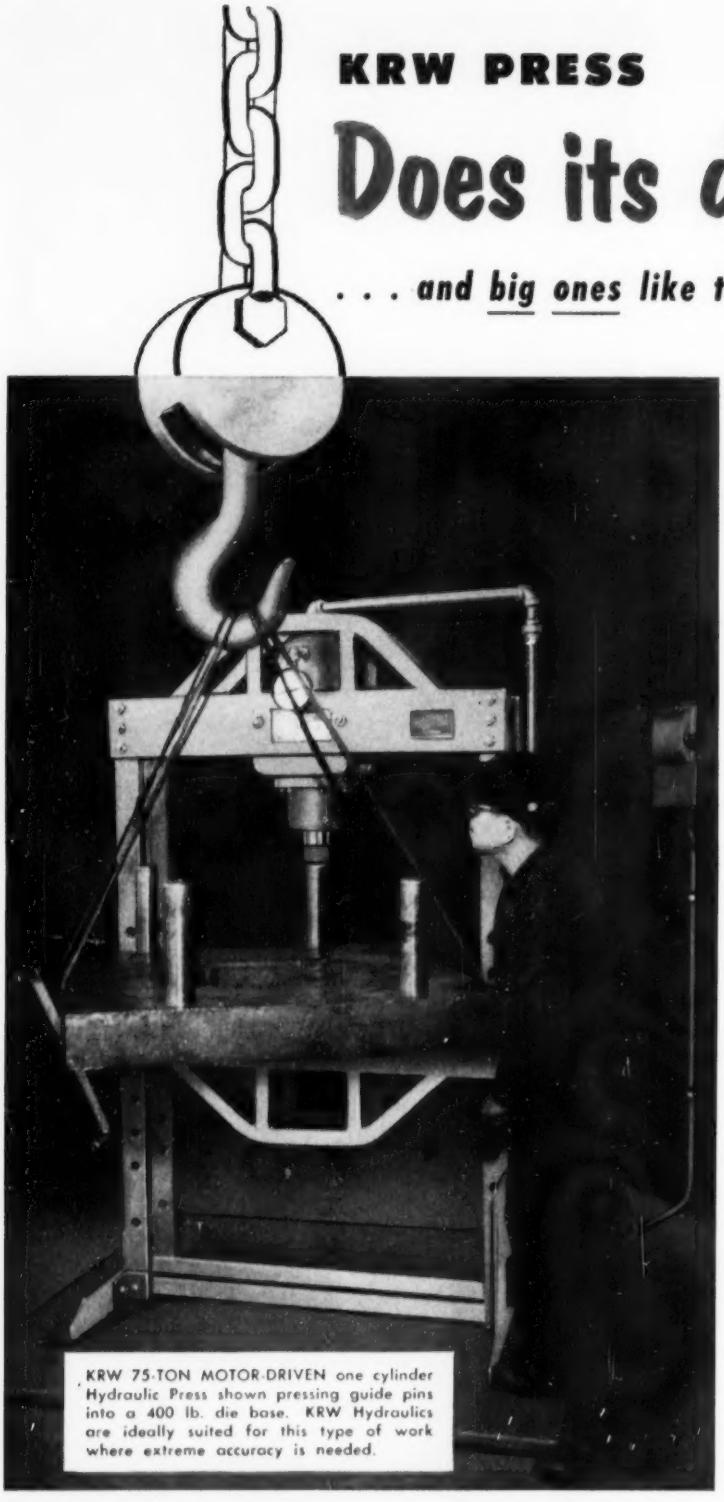


"G Bond Wheels Cut Faster, with twice as many pieces per dressing," says a customer reporting on a centerless grinding application.

KRW PRESS

Does its daily dozen

. . . and big ones like this are just routine!



KRW 75-TON MOTOR-DRIVEN one cylinder Hydraulic Press shown pressing guide pins into a 400 lb. die base. KRW Hydraulics are ideally suited for this type of work where extreme accuracy is needed.

That's a 400 pound die base in the KRW Hydraulic Press at left. Offhand you might think that it's biting off more than it can chew. But not this press! It's been doing a dozen jobs like this daily for two years.

The Press is used in the Specialty Shop of a large steel company which makes everything from ornamental iron railings to end "spiders" for lawn mowers. It does a wide variety of jobs such as pressing pins in bearings, straightening bent roll shafts, pressing die shanks into punch holders and compressing springs on die strippers before dismantling dies — an important safety feature in this Shop.

LOOK AROUND YOUR SHOP!

You'll probably find several jobs that could be done faster, more easily with a KRW Hydraulic. They're amazingly versatile and their cost is surprisingly low. 25-150 ton capacities; one, two and three cylinder models; hand operated, air operated or motor driven. If you need a special Press we'll design and build it for you.

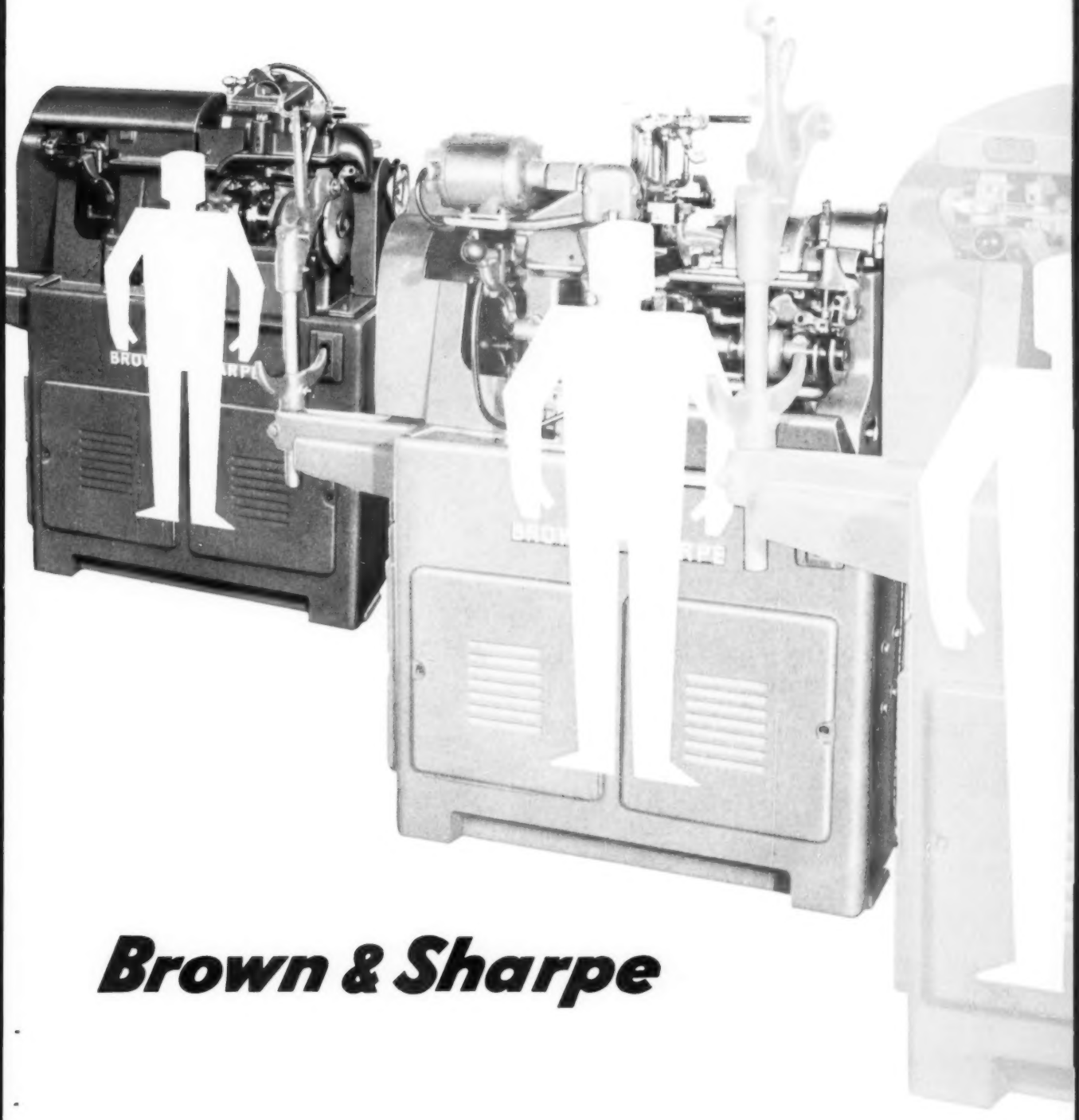
Write Dep't. 11 for specifications and prices.

K·R·WILSON

215 MAIN ST., BUFFALO 3, N. Y.

Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!

3 metal-working specialists want jobs



Brown & Sharpe

Single-Point Turning "Expert" ...

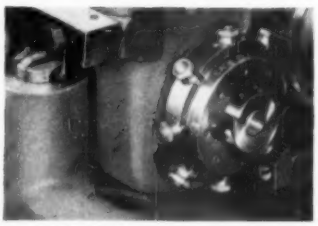
...does accurate pinion and staff work without skilled supervision

Brown & Sharpe

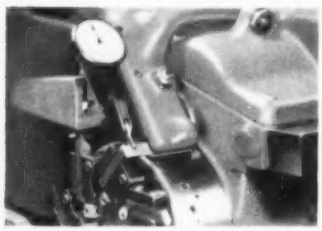
Automatic Pinion Turning Machine

You do not need highly skilled craftsmen to set-up and operate this machine. It's designed to make accurate pinion and staff turning practically automatic. Look at these advantages:

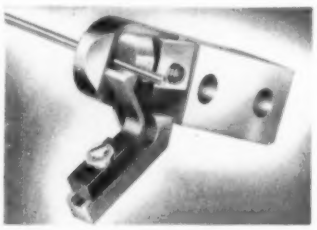
Sharpen tools on top only . . . uses circular-formed, single-point tool blades that retain shape throughout tool life.



Cut to size every time . . . just set positive micrometer tool stop on each tool. No precise cams needed for sizing . . . uses only two easily formed disk cams.



Simple, accurate replacing of tools after sharpening . . . dial indicator on swinging arm gives exact location of tool point, while reground surface locates tool in holder.

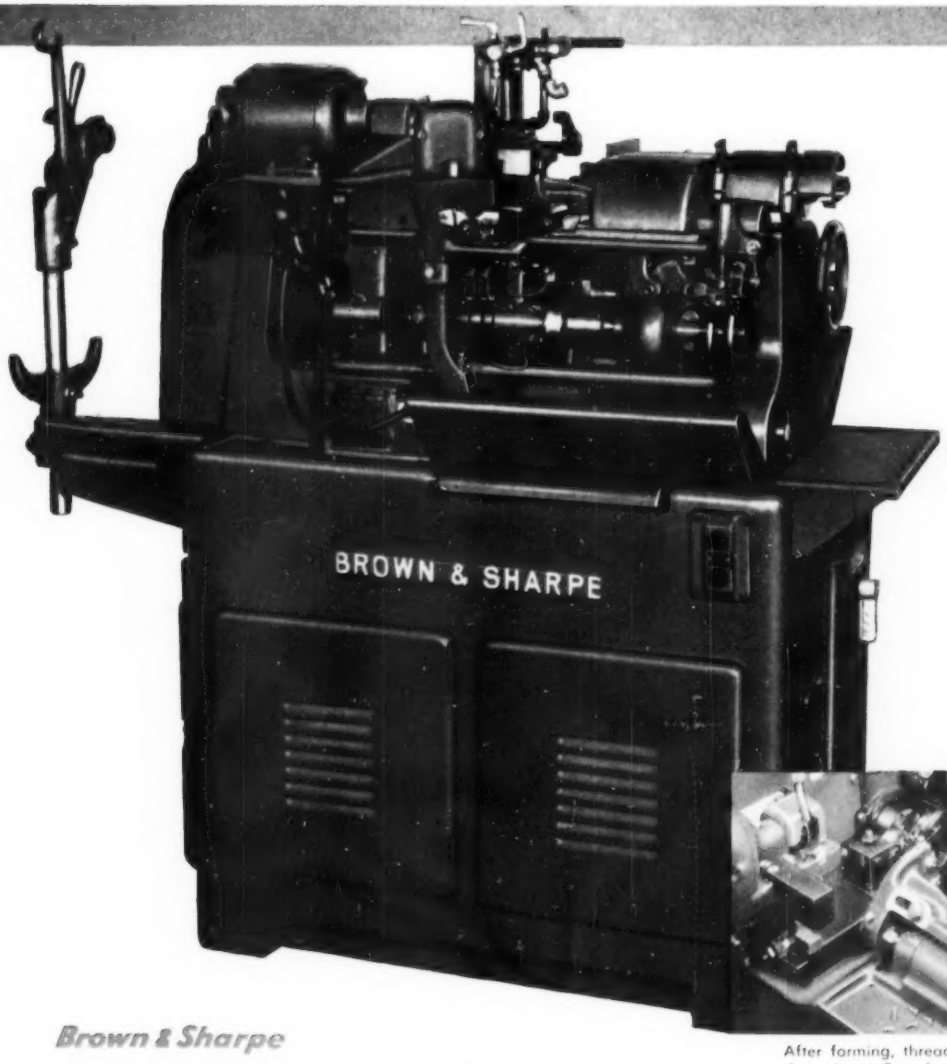


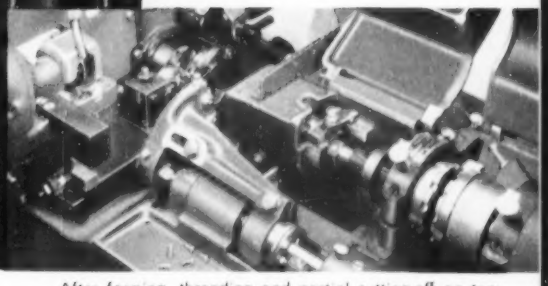
Maximum concentricity of cuts . . . 8-tool turret permits all cuts to be taken from same position and allows work to be supported in a single V-rest for all sizes of stock, instead of oversize bushings.

Before buying any equipment for single-point turning on work to ¼" dia., be sure you have all the facts on this cost and trouble saving Brown & Sharpe Automatic Pinion Turning Machine

Screw Threading "Professional"...

...does **4** operations at once, makes screws, pins, bushings at unbelievably high speed





After forming, threading and partial cutting-off on tandem pieces, Transfer Arm swings into position to move finish-turned piece from work spindle to slotting mechanism.

Brown & Sharpe

Automatic Screw Threading Machine

This machine minimizes idle time by overlapping such operations as forming, threading, slotting and partial cutting-off. Two opposed spindles (the work and threading spindles) rotate in the same direction but at different speeds . . . permit threading and partial cutting-off on one piece while forming is performed on a succeeding piece. At the same time, a third piece is slotted in the automatic slotting mechanism. Thus, unusually high production of a wide variety of small screws, pins, bushings, etc., is possible at lowest cost. Takes stock to 3/8" dia. Many other features combine to make this machine a highly profitable investment for any screw machine department. Write for full details.

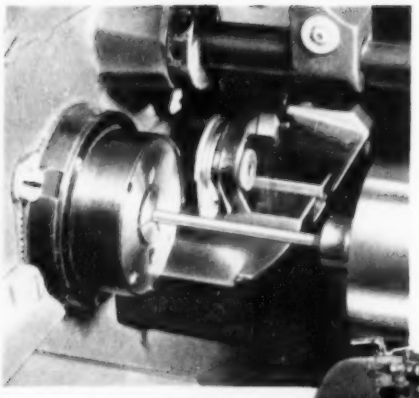
Cutting-Off "Automaton"...

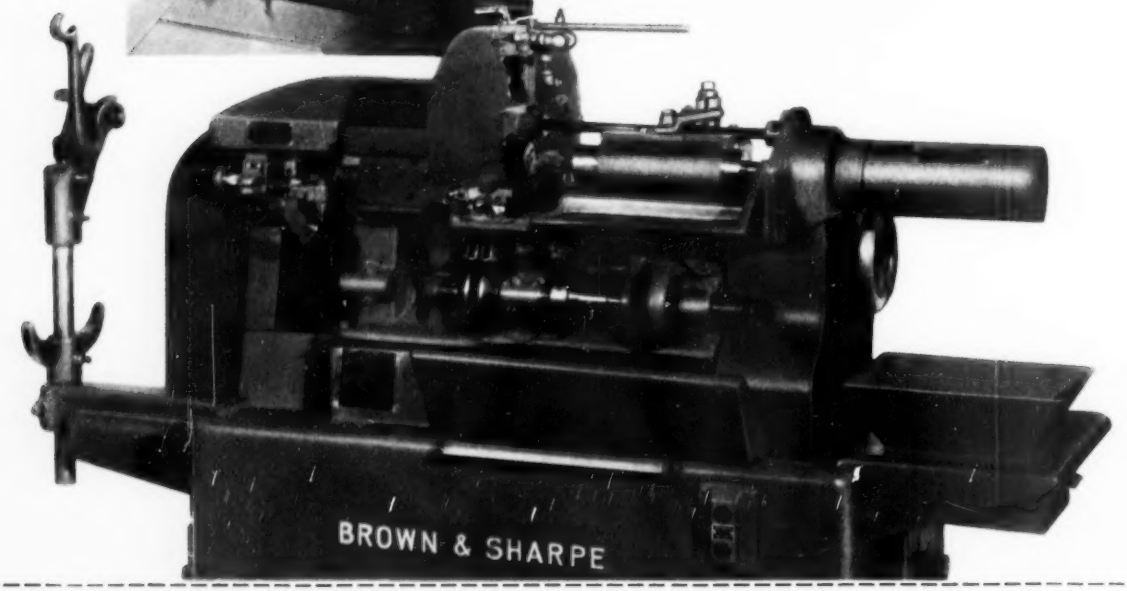
...holds work with "both hands"... forms and cuts off, leaving smooth cut-off ends

Automatic
Cutting-Off Machine

(Opposed Spindle Type)

You can eliminate second operations on work requiring smooth cut-off ends with this opposed spindle type Automatic Cutting-Off Machine. It holds work securely on both ends permitting cut-off tool to pass through the work axis while the piece is being rotated by both the work and opposed spindles . . . leaves a clean cut-off end. 59 production rates and spindle speeds from 6000 to 545 r.p.m., easily selected, adapt the machine to a broad variety of materials. Takes stock to 3/8" dia. Write for illustrated Catalog.





Brown & Sharpe

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

CIMCOOL LOWERS COSTS *and does a better job!*

It's no secret that CIMCOOL® opens the way to real savings. Plant after plant reports that this radically new and different cutting fluid—this *chemical emulsion*—does a *better job*, while saving money three important ways:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.
- FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

It's a safe bet that one week's run will convince you that Cimcool is far superior to old-fashioned coolants. For a demonstration in one of your own machines, write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

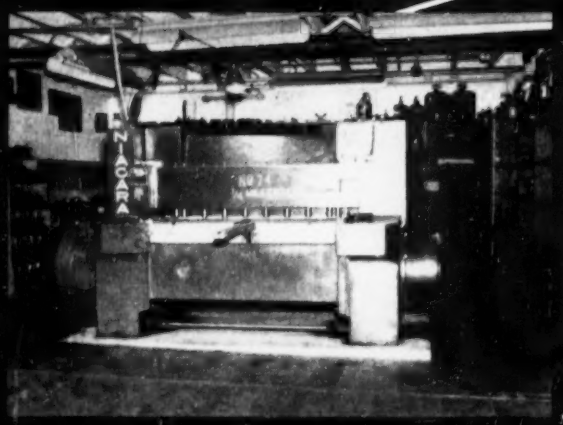
CIMCOOL

for 85% of all metal cutting jobs

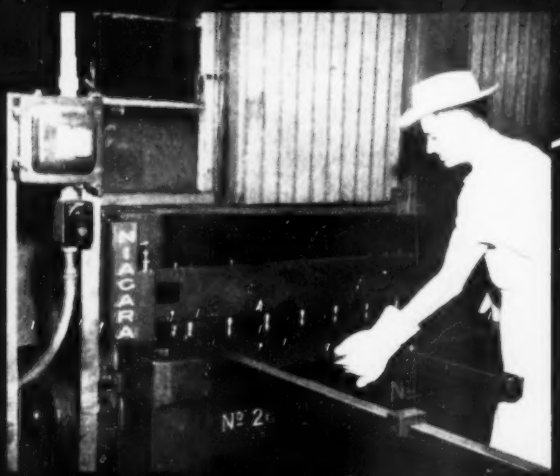
A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

NIAGARA

SERVE INDUSTRY FROM



ELECTRONICS. Cutting .003" molybdenum to within .001" and ¼" copper with no change in set-up at a plant in California

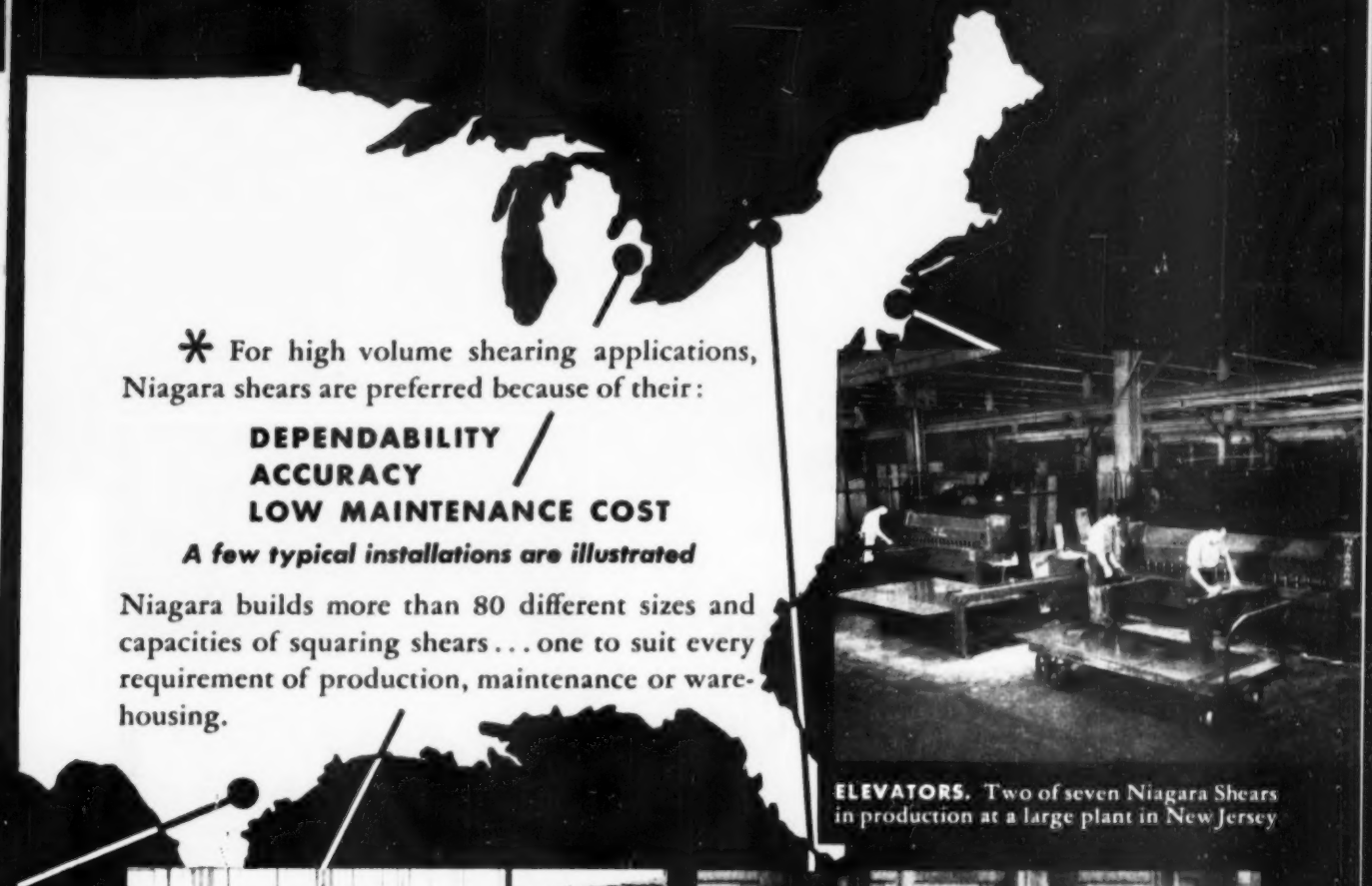


DRUMS. Shearing sheets for drum bodies in Texas

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

SHEARS

COAST TO COAST



✱ For high volume shearing applications, Niagara shears are preferred because of their:

DEPENDABILITY
ACCURACY
LOW MAINTENANCE COST

A few typical installations are illustrated

Niagara builds more than 80 different sizes and capacities of squaring shears . . . one to suit every requirement of production, maintenance or warehousing.

ELEVATORS. Two of seven Niagara Shears in production at a large plant in New Jersey

WAREHOUSE. Shearing thousands of tons of all kinds of steel at a steel warehouse in Michigan

AUTOMOBILES. Continuous operation in a cut off line at a body plant in Western New York

America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

SENSITIVE SCALE, with feather balanced against pile of tiny grinding grits, shows that even a feather weighs more than these cutting tools.

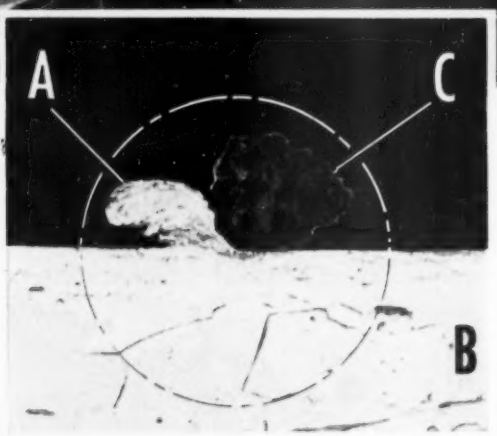
A FEATHER OUTWEIGHS THESE CUTTING TOOLS

Core of an entirely new approach to grinding wheels is the tiny grinding grit. Years of research by Cincinnati Milling has confirmed that grinding is a true chip cutting process.

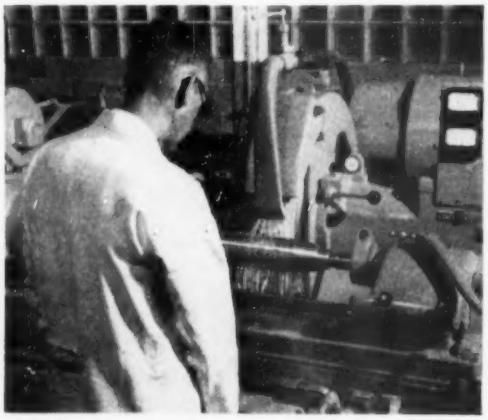
Here is the starting point of development of the grinding wheel as a true cutting tool. Cincinnati Milling has developed and tested CINCINNATI GRINDING WHEELS over a period of several years as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of CINCINNATI GRINDING WHEELS, write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co. Or, if you prefer, write for the free booklet "A New Concept In Grinding Wheels."

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



FROZEN ACTION—Tiny steel chip (A) is shown being cut from workpiece (B) by a grinding grit (C).



EXPERIMENTAL WHEEL'S performance is checked by member of research staff on one of several grinders in the Cincinnati Grinding Wheels Laboratory.

This WALKER-TURNER 20" OVERHEAD DRILL PRESS SET-UP

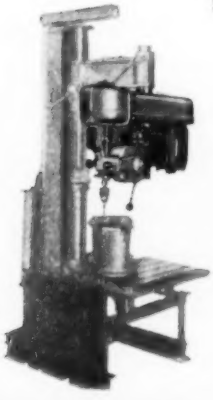
saves handling time . . . cuts costs

Wherever large or heavy parts or units are to be worked, this set-up—utilizing a WALKER-TURNER DRILL HEAD with its special ball-bearing carriage traveling along a boom—can save handling time and costs . . . bring new production economies. Special set-ups like this make it possible to get WALKER-TURNER precision drilling (either hand or power feed) at surprisingly low cost.

WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

DRILL PRESSES—Hand and Power Feed • RADIAL DRILLS • Wood and Metal Cutting BAND SAWS • TILTING ARBOR SAWS • RADIAL SAWS JIG SAWS • LATHES • SPINDLE SHAPERS • JOINTERS • BELT and DISC SURFACERS • FLEXIBLE SHAFT MACHINES

SOLD ONLY THROUGH *TRAINED* INDUSTRIAL DISTRIBUTORS



Almost Unlimited Application

WALKER-TURNER Drill Heads may be used for almost unlimited applications. The illustration left shows a set-up in daily use performing as a radial drill of extra large capacity.

Horizontal and angular mountings—in single units or in batteries—are making substantial savings for hundreds of manufacturers.

For complete information, write your name and address in the margin of page.

Use this space

to write for full details and specifications.
Walker-Turner Division, Kearney & Trecker Corp.
Dept. AM9 Plainfield N. J.

(Please write your name and address in margin of page)

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed Shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Write for Catalog.

Hydroformed!

1 Operation!

JOB FACTS: 22¼" ID vessel drawn to 7⅜" depth from a 32" dia. blank of ⅛" stainless steel in *one* operation. Note part contours and surface detail. Part drawn on 32" Cincinnati Hydroform.

HYDROFORM FACTS: Whether drawing large or small diameter parts, having simple or complex shape, Hydroform users report greatly reduced tool costs—improved part quality—substantial reductions in the required number of operations—many other benefits. Can *you* use these economies? Then investigate Hydroforming *now*. Call in a Cincinnati Milling field engineer. For a description of the five sizes of Hydroform machines—12", 19", 23", 26", 32"—write for your copy of Bulletin M-1759-2.

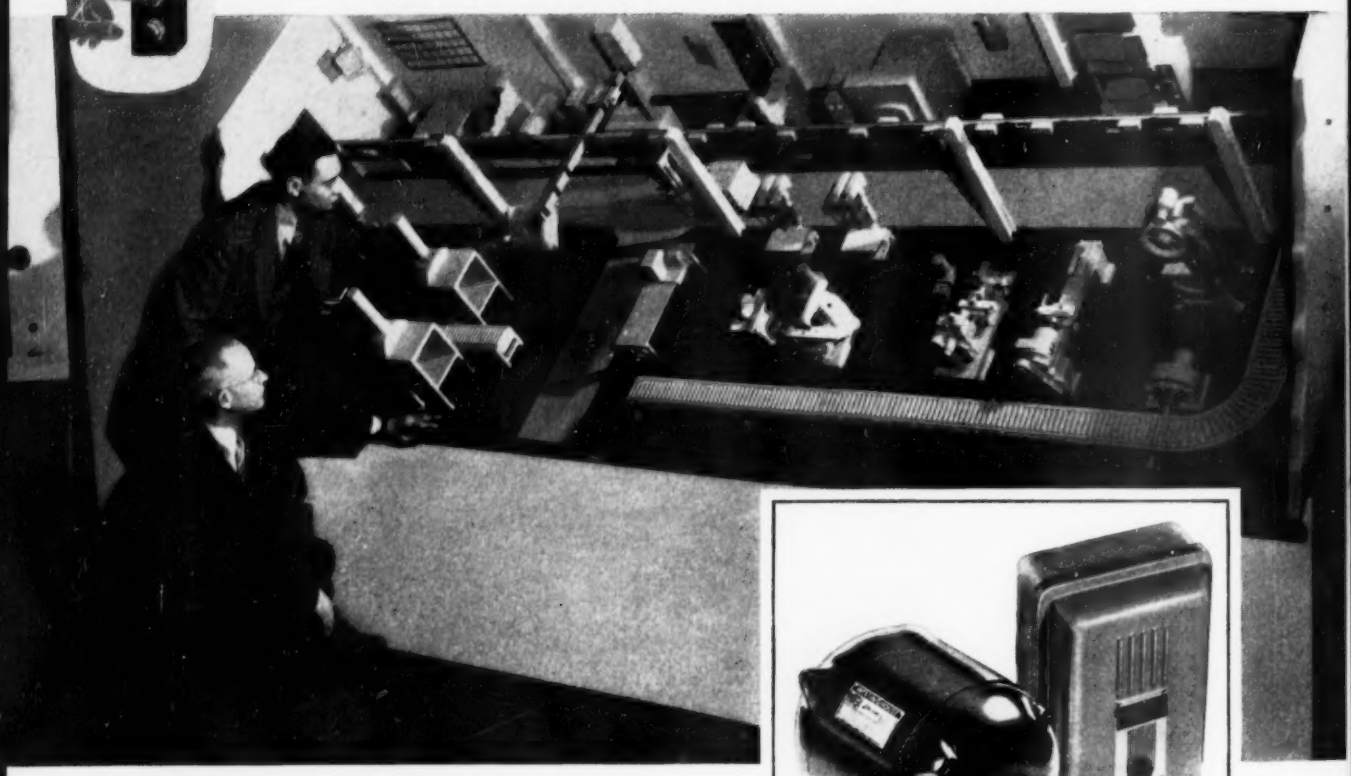
CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U.S.A.

Hydroform

AUTOMATION STARTS WITH WESTINGHOUSE MOTORS AND CONTROLS



How Westinghouse works with you to select motors and controls best suited for each job

Careful planning and proper application of motors and controls become even more important as more production processes become automatic. From 126 offices, Westinghouse offers you exactly this type of comprehensive planning and assistance in applying motors and controls.

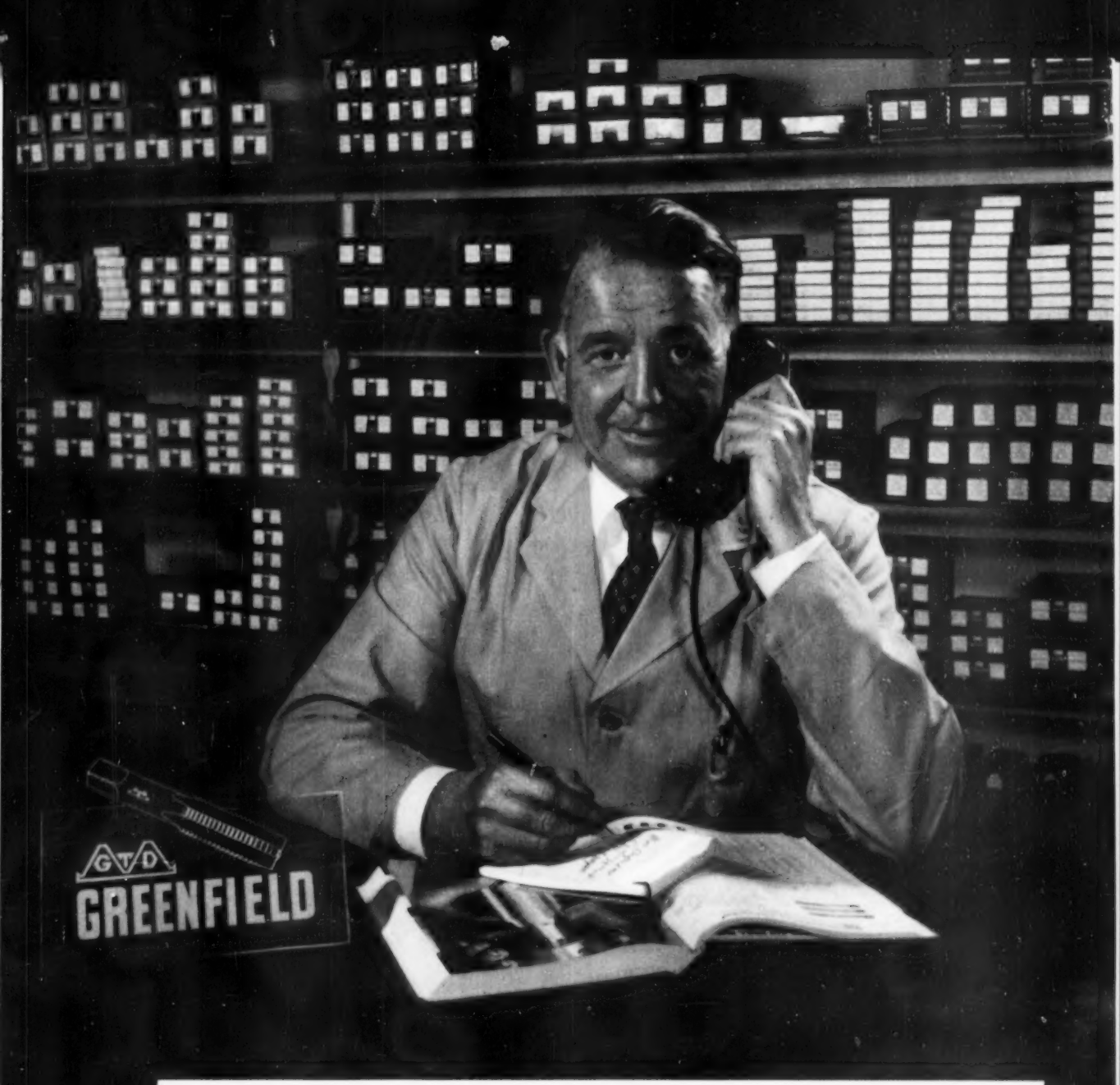
Qualified Westinghouse engineers will gladly work with you in studying your motor and control problems. They'll offer suggestions and, if you like, recommend equipment best suited for your needs. These engineers are specialists in various fields. In every industry, the knowledge and experience of a Westinghouse engineer will prove valuable. This assistance is available on local as well as national and international levels, making possible close cooperation and full understanding of your particular needs.

Thirty-seven strategically located Manufacturing and Repair Plants bring you local factory service. Fully equipped and expertly manned, they quickly handle any motor or control servicing need. Then, too, there are the well-stocked Westinghouse Warehouses, so located as to assure speedy delivery of genuine renewal parts.

Literature available—Considering the applications of motors and controls? Ask your local Westinghouse representative to give you *10 Case Histories of Life-Line* Motors,* booklet B-4769-A. Ask, too, for the complete-line booklets on Westinghouse controls, B-6051 and B-5882; or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-21745

*Trade-Mark

YOU CAN BE SURE... IF IT'S Westinghouse



"YES...WE'VE GOT THOSE TAPS IN STOCK"

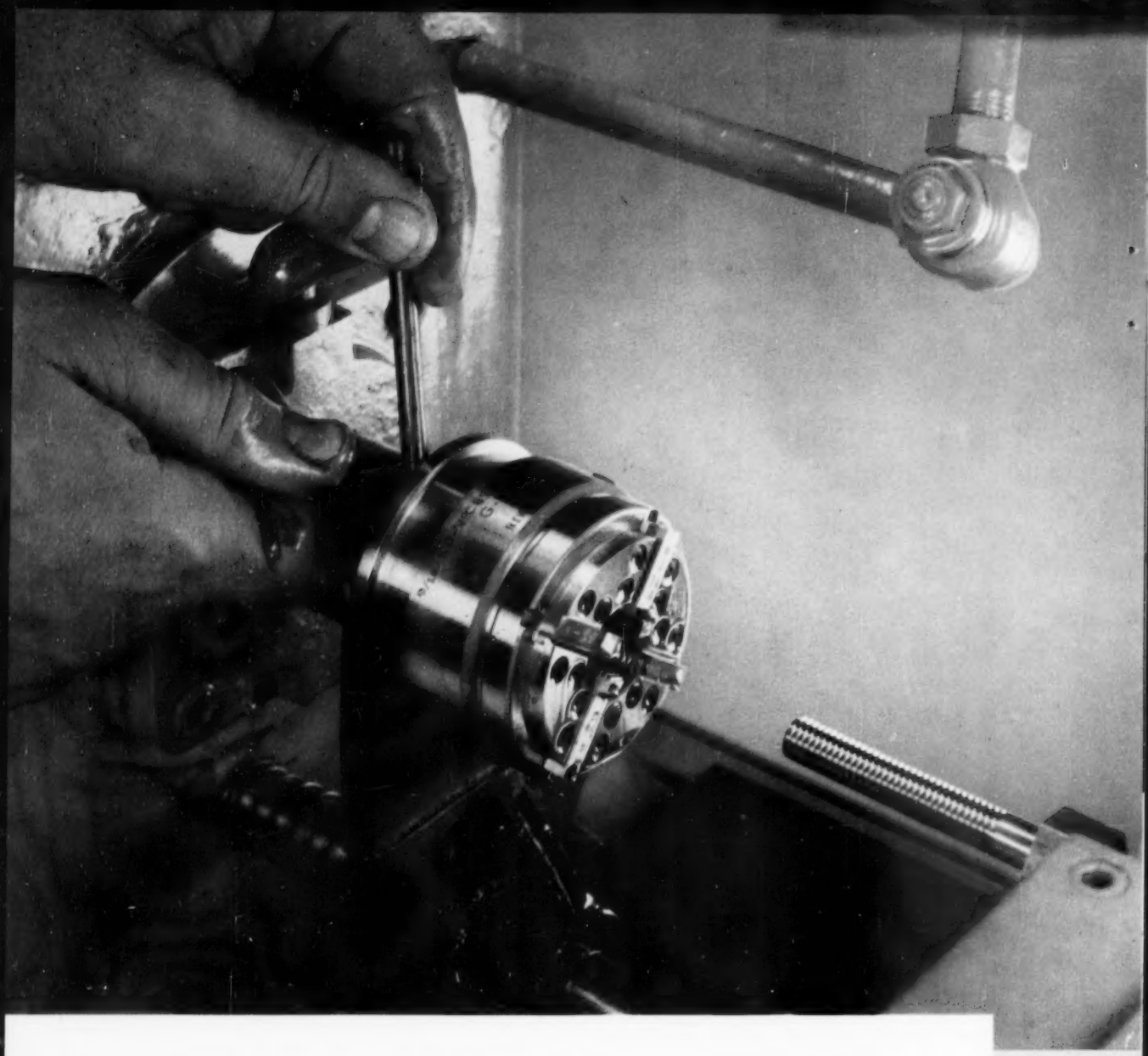
That's your INDUSTRIAL DISTRIBUTOR talking. Many a time, no doubt, you've heaved a sigh of relief when you've heard the welcome words, "Sure we've got 'em", or when you need service, "We'll send Jack right over".

And your GTD-GREENFIELD Distributor also has direct friendly contact at the factory with men he knows well, regarding non-stocked items or special tools.

Yes, it will pay you to get better acquainted with your GTD-GREENFIELD Distributor. Stop shopping around . . . stop buying the hard way.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.



QUICK ADJUSTMENT..ON THE MACHINE!

For high-speed service on live spindle machines, the KD Rotary Self-Opening GEOMETRIC Die Head is compact, accurate, well balanced . . . made for long, trouble-free life. Chasers are adjusted merely by loosening a Binding Screw and turning Adjusting Ring for desired size. No need to take the head off the machine, even to change the chasers.

Available in seven sizes for #0 to 2½" diameter threads. Hollow shanks allow threading to any length. A positive-opening flange trip provides for repeat threading to identical lengths.

Write for full details. Specify Bulletin KD

Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

NEW HAVEN 15, CONNECTICUT

GEO MET RIC

POCO HTB GREASE

hangs on through HEAT and WET!

Proves usefulness over wide range of temperature and moisture conditions.

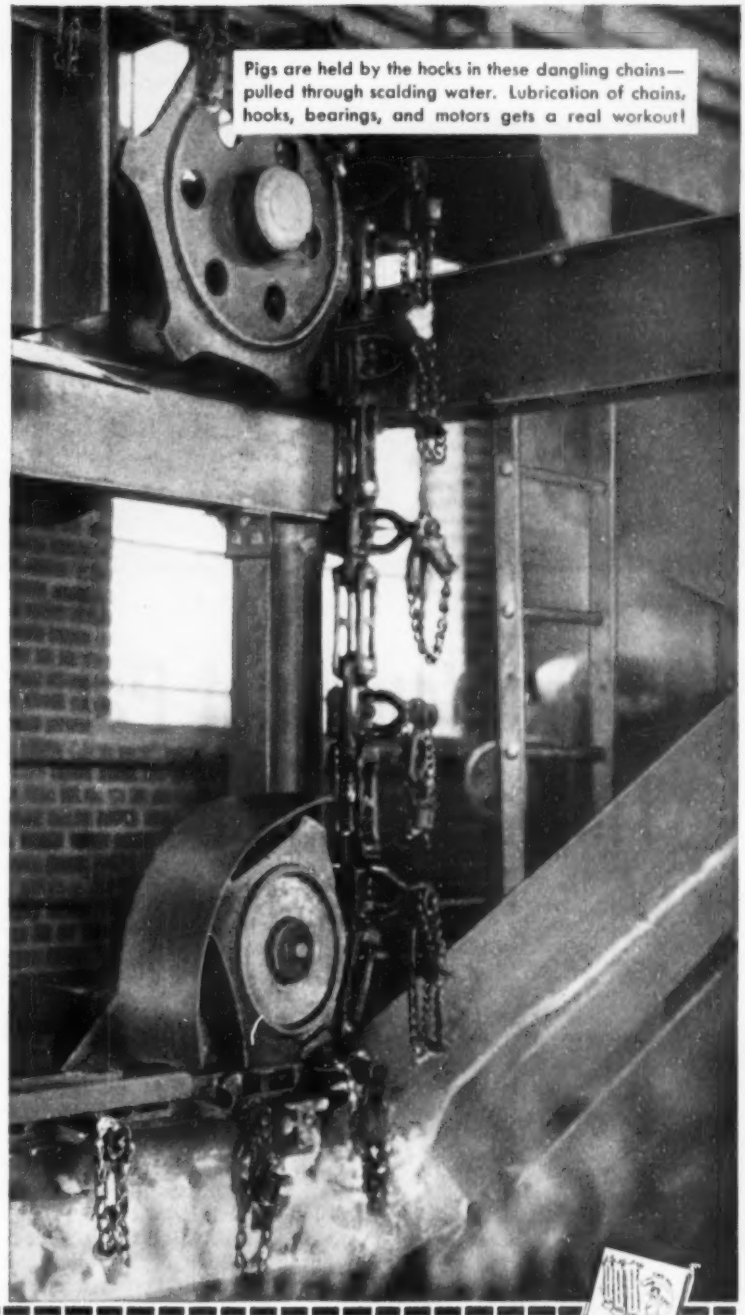
In meat packing plants, as in many others, POCO HTB Grease is widely used with outstanding success as a general purpose lubricant. High film strength and adhesiveness over a wide range of temperature and moisture conditions make this possible.

POCO HTB is one of a group of Pure Oil multi-purpose industrial lubricants that you can turn to advantage to simplify your lubrication practice—and reduce your lubricants inventory.

Find out more about this versatile compact line of oils and greases designed to do so many jobs equally well. In most plants no more than six lubricants are needed to do the entire lubrication job with complete success. By reducing the number of lubricants used in your plant to six or less, you can slash application costs, minimize waste and error.

Tear out that coupon now and mail it today. You'll get full details on how to start a new labor-saving, money-saving, lubrication program in your plant.

KEEP IT PURE, AND SIMPLE!



Pigs are held by the hocks in these dangling chains—pulled through scalding water. Lubrication of chains, hooks, bearings, and motors gets a real workout!

BE SURE PURE WITH PURE

PURE OIL INDUSTRIAL LUBRICANTS

FREE BOOKLET

The Pure Oil Company, Industrial Sales Dept. A-39
35 E. Wacker Drive, Chicago 1, Illinois

Please send me your free booklet on how to "Simplify and Save".

NAME_____

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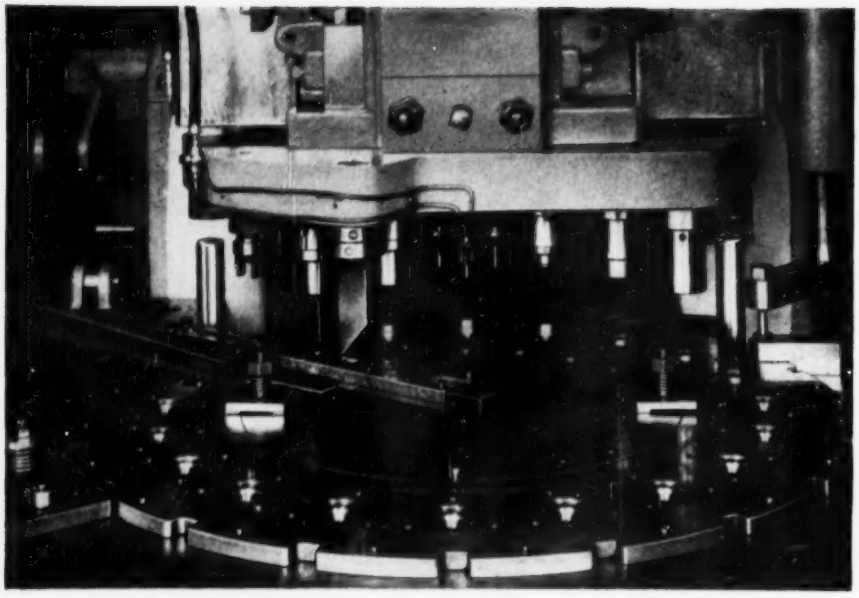
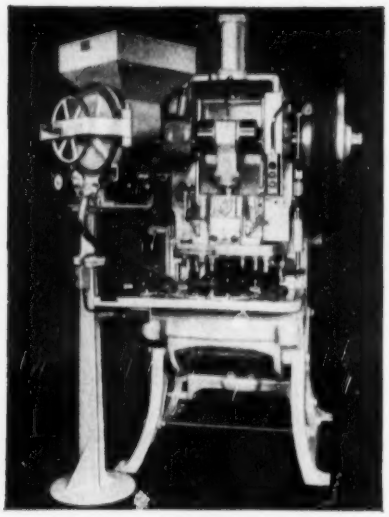
Be sure with Pure Sales offices located in more than 500 cities, including: Atlanta . . . Birmingham . . . Charleston . . . Charlotte . . . Chattanooga . . . Chicago . . . Columbus . . . Indianapolis . . . Jacksonville . . . Madison . . . Memphis . . . Miami . . . Milwaukee . . . Minneapolis . . . Pensacola . . . Pittsburgh . . . Richmond



All important tooling is in plain sight, easily accessible for maintenance or adjustment, the way it would be designed by the company that makes V&O easily tooled long slide presses and V&O safe operation dial feeds.

When You Want Parts not Problems Think of Equipped Presses by V&O

Equipped presses can combine a few operations or make a complete product . . . .



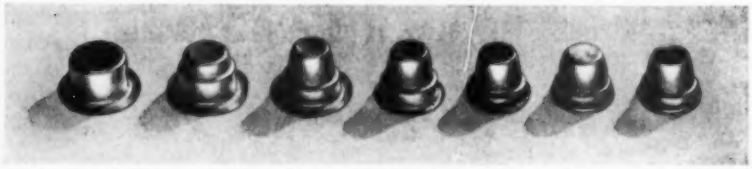
Pour blanks into the hopper at the upper left, push the starting button, and take the finished parts away. That is all the operator of this machine needs to do — or needs to know how to do.

The product is a low vapor pressure can closure. Its user wanted products, not press tooling problems. So V & O supplied a complete machine to do the job.

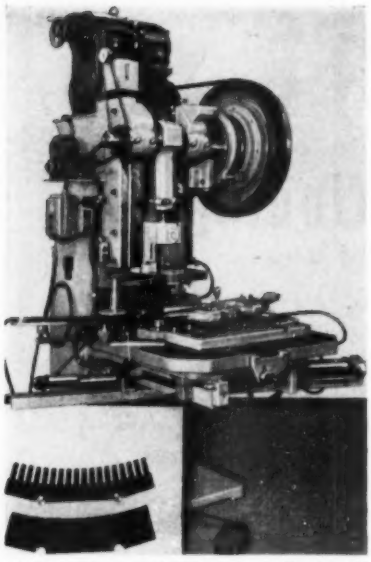
All the operator needs to do is feed blanks into a hopper and take finished parts away. The hopper delivers to a dial feed. Several operations then are automatically performed: draw, first re-draw, second re-draw, trim, curl, close curl, and pierce. The machine cannot falter, cannot commit any "human" errors.

Completely gone are such intermediate operations as materials-handling of the pieces from one of these operations to another, and hand-placing of partly finished pieces in dies. One press is doing work that formerly would have required several. Floor space requirement is minimized.

There are thousands of parts designs for which operations can be combined and simplified in this manner. You probably have some in *your* shop. Why not write V&O about them?

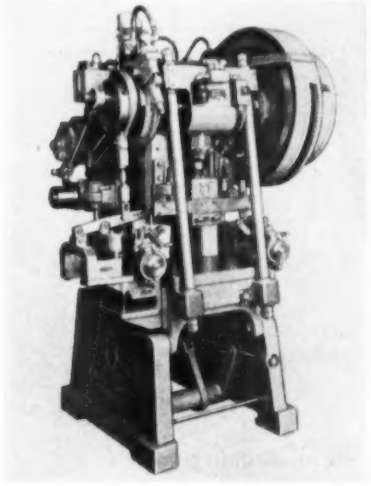


Left to right: Draw, first re-draw, second re-draw, trim, curl, close curl, pierce.



V & O Segmental Notcher, an Equipped Press for a specified field.

V & O High Speed Press, one of a family of Equipped Presses.



Special Presses by V&O Designed to Improve Specific Types of Operations

Notching Presses

● V & O Notching Presses are the highest precision, highest speed, and most adaptable set up machines ever offered for this purpose. They are an example of V & O Equipped Presses designed for a field of usage rather than for the making of just one part.

High Speed Power Presses

● V&O High Speed Presses move too fast for the average operator to keep up. Hence, they are equipped with roll feeds, scrap cutters, other devices to do what the operator might otherwise do. They are a family of perfectly integrated high precision Equipped Presses.

WRITE US, PLEASE

One of our engineer representatives is near you. Our catalog is yours for the asking. Please write The V & O Press Company, Division of Emhart Mfg. Co., 301 Union Turnpike, Hudson, N. Y.

THE V&O PRESS COMPANY

Division of Emhart Mfg. Co.

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

HUDSON NEW YORK

Only the best is good enough

Why Users Hold Onto V&O Presses

Long Slide Advantages

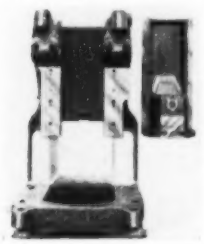
● Long slide precision and tooling ease can't be found on just any press you pick up. Users keep V & O Presses to keep those advantages in their shop.

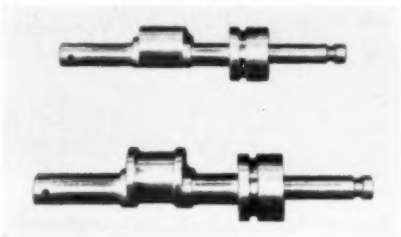
Stiffer Eccentrics

● The operating results show that stiffer eccentrics mean better presses. You cannot find V & O stiffness in just any press you pick up. So users keep their V & O's. Shown are full eccentric and modified eccentric shafts.

Hand-Scraped Accuracies

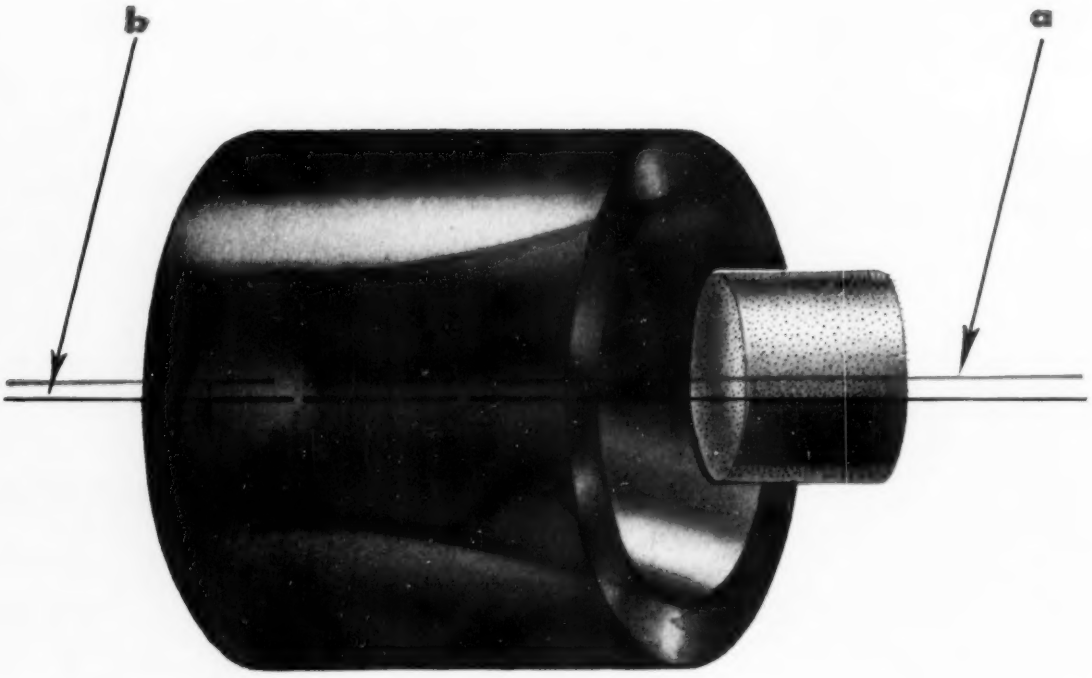
● You will not find hand-scraped slides and bearings in just any press you pick up. But these operations make big differences in press performance. Users want those V & O accuracies to stay in their shops.





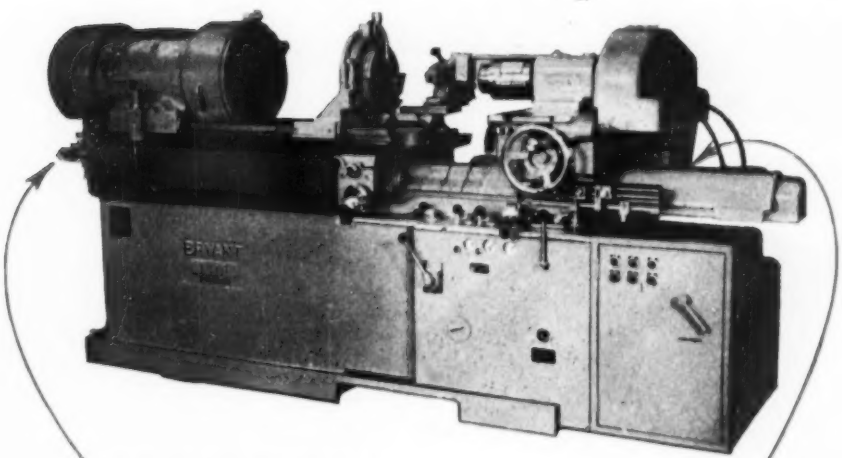
alignment

for better internal grinding



TO GRIND a taper, the internal grinder must be set up according to simple geometric principles; that is, the path of the grinding wheel must be a straight line and must intersect the axis of the workpiece at a point. In the illustration, the axis of the wheel path "a" and the axis of the work "b" lie in parallel planes. The axes cross, but fail to intersect. Under these conditions, it is impossible to grind a true taper. As the grinding wheel enters the large end of the taper, the point of contact is high. This end of the taper can be ground to size. As the wheel progresses through the hole, the contact moves even higher, with the result that the hole will be progressively oversize and a curve is generated instead of a uniform taper.

A taper ground under these conditions probably will blue only in the middle. Turning the workhead may shift this plug contact but, as the wheel wears, the plug contact will continue to move. The remedy is to correct alignment so the wheel path and wheel axis "a" and the work axis "b" intersect and lie in a plane which includes the diamond. Then a uniform taper will be generated. In shop practice the adjustment would be made by bringing the wheel and work to exactly the same center height.


BRYANT
Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.
Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This semi-automatic machine is for grinding bores in long parts and is adaptable for either production or tool room work. It will swing work up to 16" and grind bores up to 9" depth. The work is held in a standard hollow work spindle and steadyrest. The workhead may be adjusted longitudinally over a distance of 37" to meet the requirements of a large variety of work. It may be pivoted for grinding a taper up to 30° included angle. Hydraulic operation provides a wide range of traverse speeds. Write for folder.

Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.

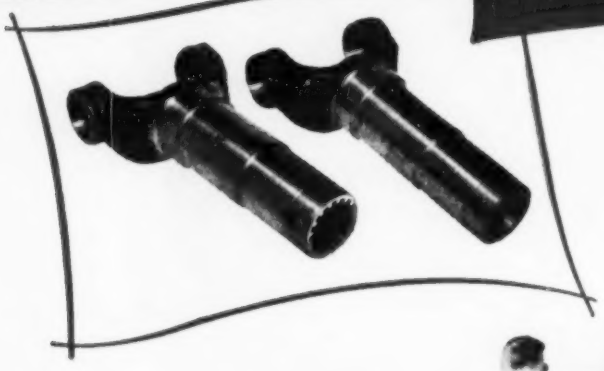
Internal grinders • Internal & External thread gages

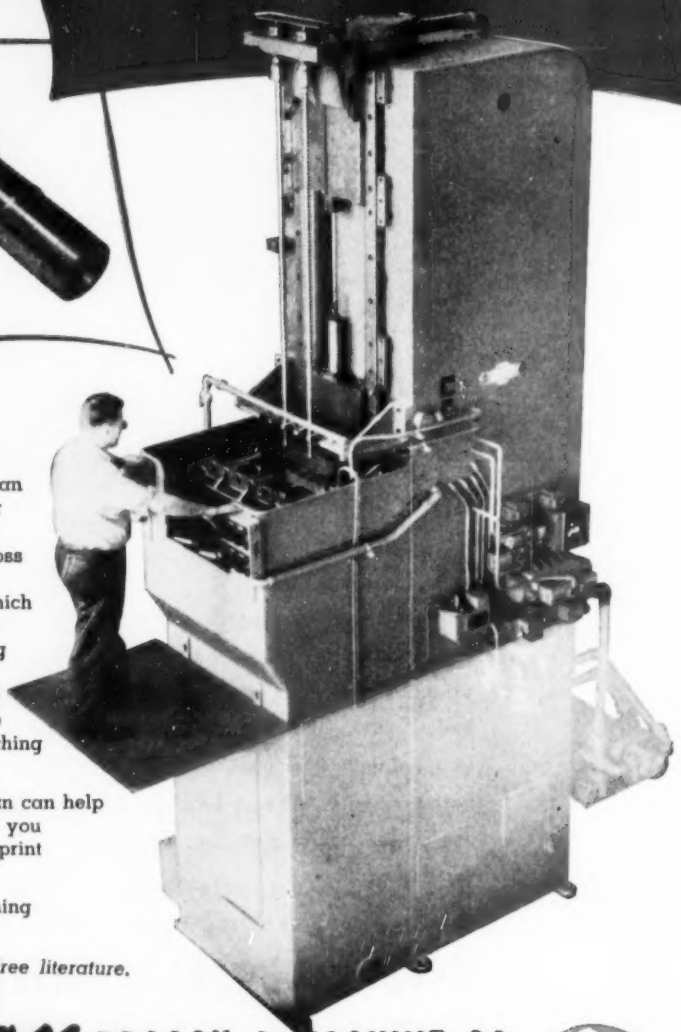
FASTER SPLINE BROACHING

the American way

Check these broaching features that make it possible...

- ✓ Multiple station set-up
- ✓ Load while broaching
- ✓ Hydraulic transfer slide
- ✓ Automatic ejection of parts
- ✓ Interchangeable tooling for several parts





Splined holes are broached simultaneously in five parts in one pass on this five-station American 40-Ton, 72" stroke pull-down machine. A transfer slide permits the operator to reload parts during the broaching cycle. The parts are loaded on cross hole locating pins mounted on the transfer slide, and then moved into stationary holding jaws, which hold them in broaching position. The slide then moves back allowing the operator to reload during the broaching stroke. After broaching the parts are automatically ejected from the spring loaded holding jaws by a swinging bar. Interchangeable tooling, easily changed over, allows for the broaching of several different parts.

This machine is another example of how American can help you obtain high production with low unit cost. If you have a metal-removing problem, just send a part print and sample for a free estimate.

American *engineers and builds all three*—broaching machines, broaches and broaching fixtures.

Write today for free literature.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

SUNDSTRAND

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

Do you need the solution to a tough, high-production metal-working problem?

If you do, Kearney & Trecker's Special Machinery Division has the "know-how" and capacity to design and build the special equipment you need

SINCE 1898 Kearney & Trecker has been aiding the metalworking industries by overcoming production difficulties with special machines and tooling or adaptations of standard equipment.

Today, its Special Machinery Division is in a better position than ever before to help you with your problems. It has a new $5,000,000 plant to work in . . . and over $2,500,000 worth of new tools to work with. The Special Machinery Division is staffed by almost 100 design, project and production engineers plus a full complement of skilled machinists and floor men.

Take the first step now

Get in touch with your Kearney & Trecker representative or contact the factory. In response, one of our Senior Project Engineers will promptly visit you and make a field analysis of your requirements. There's no obligation, of course.

Our Customer Engineering Service takes over your production headaches

After all the facts have been gathered, a team of Project Men in our Customer Engineering Service will review the job. These widely-experienced, practical-minded men will check the work-piece itself . . . how to hold, machine and process it . . . and every other contributing factor. They'll develop preliminary sketches and get started on a proposal.

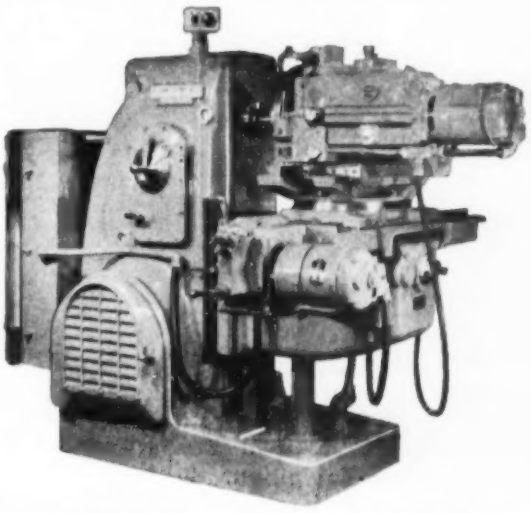
You get quality equipment, delivered when promised, carefully installed

As the Special Machinery Division is an integral part of the Kearney & Trecker Corporation, every product is fully supported by the entire organization's financial, physical and personnel resources. This means that, in addition to the machine or machines of exceptional quality that will solve your difficulties, you get delivery as promised plus fully supervised installation and followup service.

We invite your inquiry

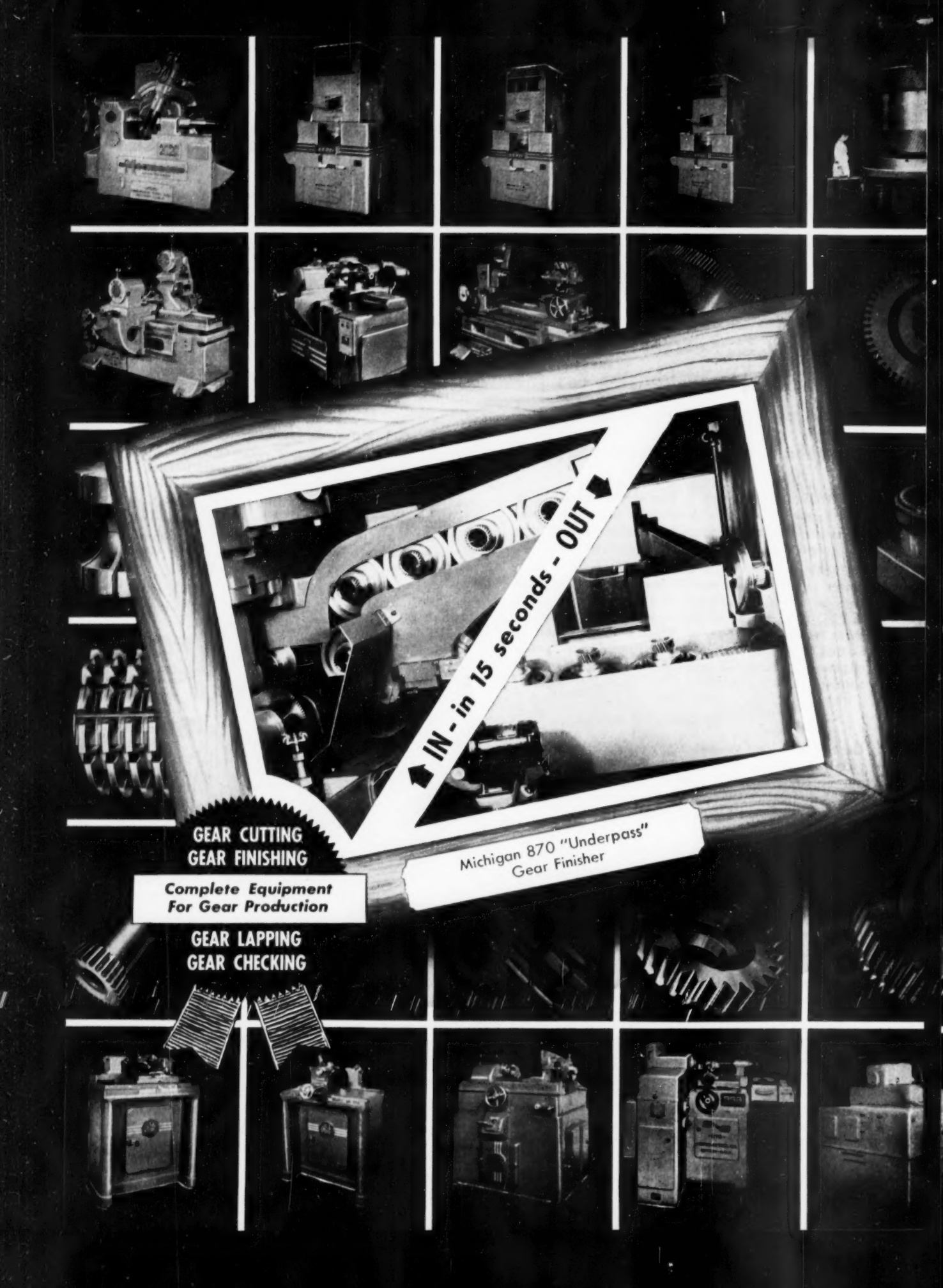
We'll be glad to provide you with any information we can. This includes sample machine specification sheets on typical special machine installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 West National Ave., Milwaukee 14, Wisconsin.



It is not always necessary to design a completely new machine. Here's an example where a standard milling machine column has been fitted with a specially designed fixture. Its job — to produce face, plate and barrel cams of differing sizes.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS


IN - in 15 seconds - OUT
Michigan 870 "Underpass"
Gear Finisher
GEAR CUTTING
GEAR FINISHING
Complete Equipment
For Gear Production
GEAR LAPPING
GEAR CHECKING

AUTOMATIC SETUP SHAVES 4 GEARS per minute

This *standard** Michigan 870 "Underpass" gear finisher – *with automation* – shaves 240 shoulder gears per hour. The 27-tooth helical gears are 2.0257" pitch diameter with 0.734" face width. The shoulder flange is 6.250" O.D.

Completely automatic operation keeps production in high gear. The operator only loads the hopper. Even pre-inspection is automatic: *A sizing fixture at the hopper mouth rejects oversize gears.*

From the hopper an air cylinder feeds parts into shaving position, one at a time. An air operated expanding mandrel clamps the gear, holds it during "Underpass" shaving (the fastest precision shaving method known), and automatically releases the gear at the end of the machine cycle.

Ejection, too, is automatic. The flange of the incoming gear pushes against the flange of the shaved gear and rolls it down a trough where it gently lays over, flange down, on a wire mesh conveyor used to transfer the gear to the next operation.

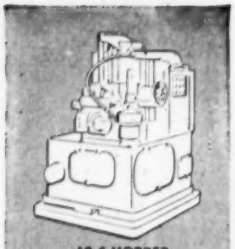
**Should the automation-equipped machine be needed for shaving other gears, it may be converted to a standard operation by removing the automatic loading mechanism and controls.*

GEAR PRODUCTION HEADQUARTERS

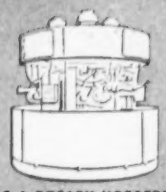
MICHIGAN TOOL CO. DETROIT 12, MICH.

COMPLETE from blank to finished gear EQUIPMENT

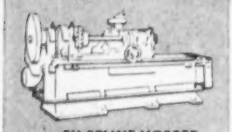
7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.



12-S HOBBER



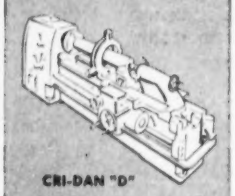
7-A ROTARY HOBBERS



SH SPLINE HOBBER

MODEL 40 THREAD MILLER

HT THREAD MILLER



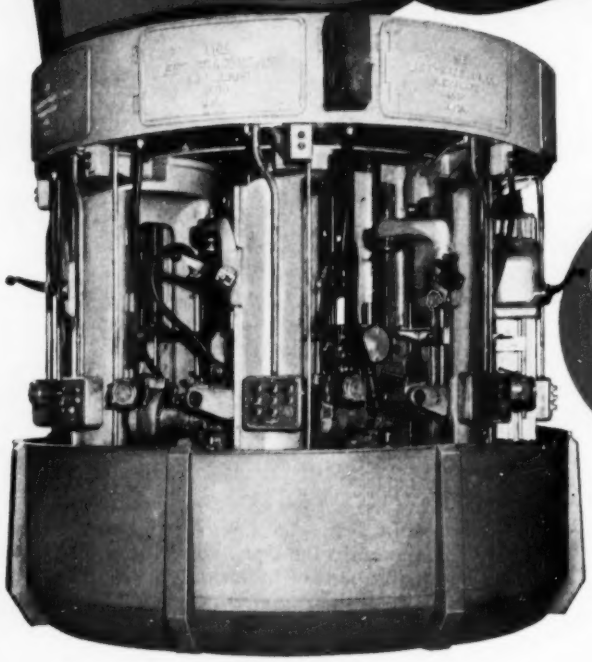
CRI-DAN "D"

CRI-DAN "B"

HIGH PRODUCTION

TOUCH-BUTTON HOBBING

With Modern Lees-Bradner 7-A Rotary Hobbers



THE LEES-BRADNER MODEL 7-A 8-SPINDLE ROTARY HOBBER

Look to Lees-Bradner, pioneers in high-production machine tools, for the ultimate in precision hobbing.

The now famous line of Model 7-A hobbers have established remarkable records in leading production plants throughout the country.

No matter what your hobbing job, or the volume of production required, there's a machine to fill your needs in the 7-A line of eight, six and four spindle rotary hobbers or the single-spindle machine.

For detailed engineering and production data call in your Lees-Bradner representative or write the company direct.

QUICK FACTS ON THE MODEL 7-A HOBBERS

- **Push-Button Production Controls**
- **Electric Hob Shifter**
- **Electronic Counter for Longer Hob Life**
- **Patented Automatic Hob In-Out Mechanism**

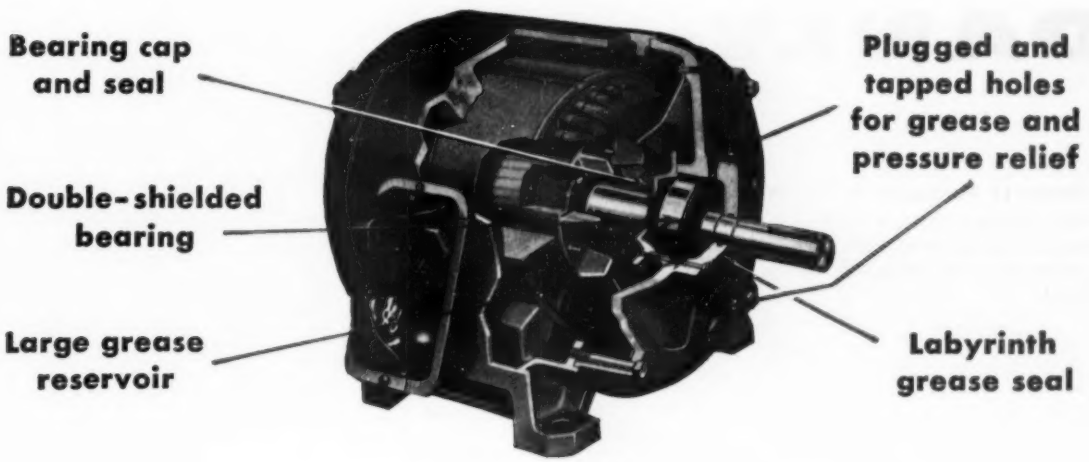
The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

Here Are Facts You Should Know About Electric Motor Bearings

An ideal motor bearing would operate for indefinitely long periods under all types of conditions without requiring any attention whatever. However, in the opinion of our engineers, such a bearing and its attendant lubricant are not yet available on the commercial market. Consequently, bearings for many types of operations, particularly where overloading, extreme temperature ranges and chemical and dirt laden atmospheres are involved, require special lubricants or regular lubrication schedules.

Of course, bearings suitable for many kinds of operation under normal conditions can be built to require no attention for very long periods — usually several years. Allis-Chalmers can supply sealed bearings in all frame sizes through 505 on short delivery and without extra cost for applications of this type.


Bearing cap and seal
Double-shielded bearing
Large grease reservoir
Plugged and tapped holes for grease and pressure relief
Labyrinth grease seal

Which is the Best Design for *Your* Application?

But, we believe that the design used in standard Allis-Chalmers drip-proof, tefc and explosion-proof motors represents the best design for most industrial users.

The Allis-Chalmers standard design consists of a prelubricated, double-shielded bearing mounted in the end housing with a generous grease reservoir. Plugged and tapped holes are provided for grease and for pressure relief. Under normal operating conditions, this design will operate as long without attention as any other type of bearing in use today. But where difficult operating conditions make relubrication desirable, it can be done as part of the normal lubricating-routine without dismantling the motor.

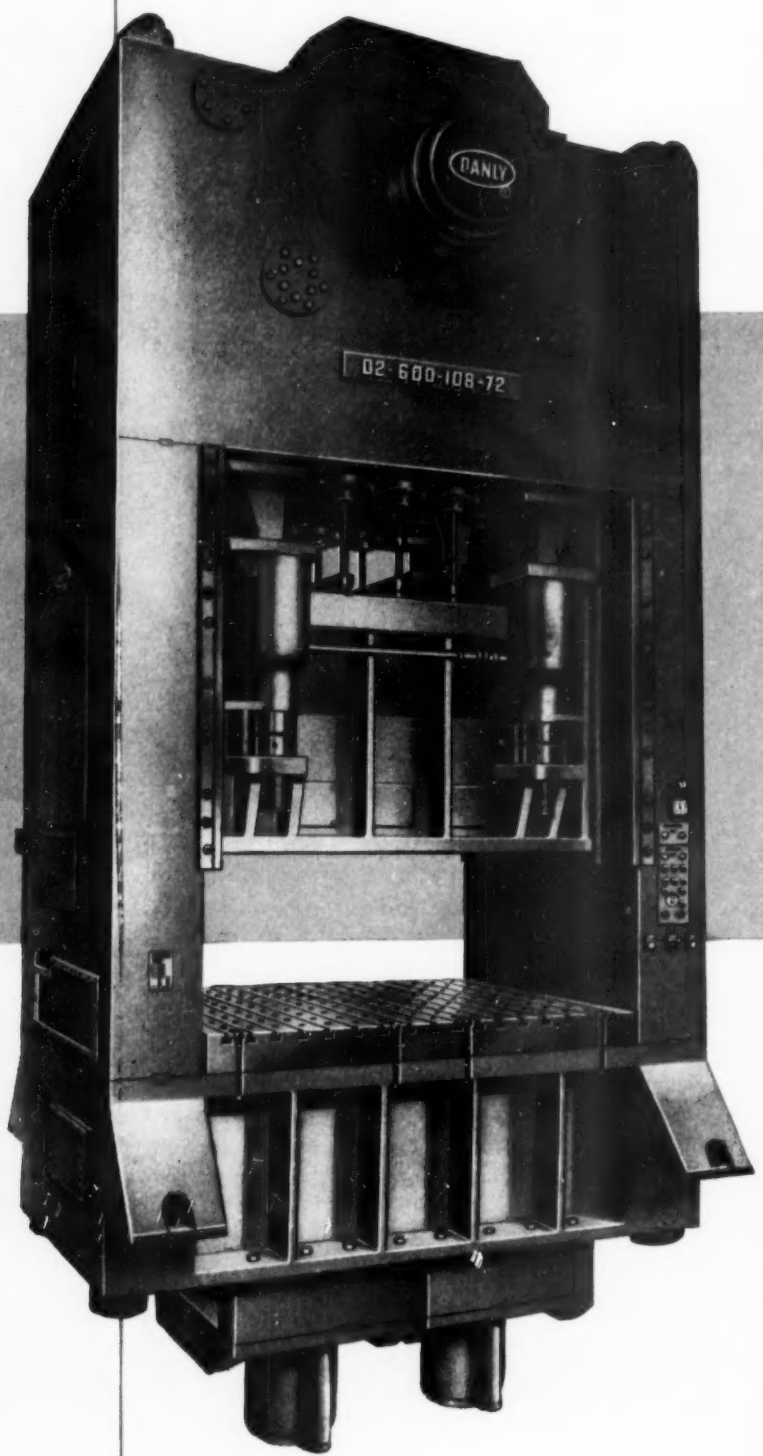
The large grease reservoir and shielded bearing design assure that grease lost from the bearing due to high operating temperatures or other causes will be replaced automatically.

For further information on bearing design and other features of Allis-Chalmers motors, call your nearby Allis-Chalmers District Office or Authorized Distributor. A-4130

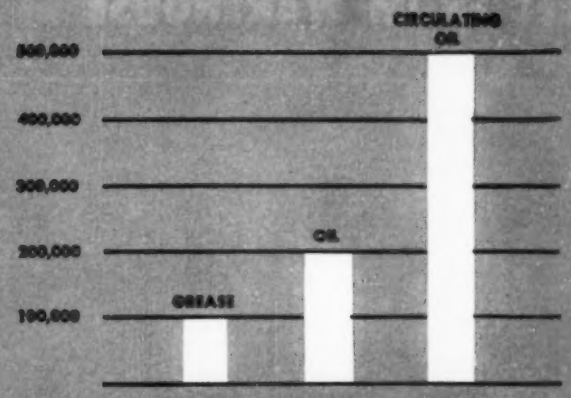
ALLIS-CHALMERS

check your maintenance records!

DANLY



SAFEGUARDED BY AUTOMATIC OIL LUBRICATION
View of 600-ton Danly Double Action Press featuring automatic *oil* lubrication to all wear points. Pressure system permits automatic safeguards against lubrication failure.



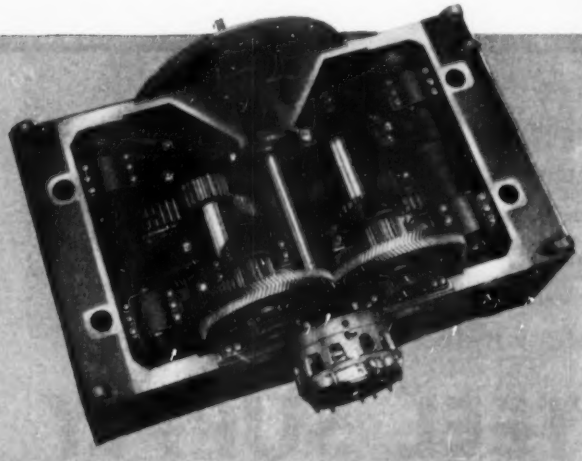
CIRCULATING OIL GIVES GREATER PROTECTION

Chart showing superiority of circulating oil lubrication for anti-friction bearings. Values at left represent bore of bearing in millimeters multiplied by speed in rpm . . . an accepted method for expressing limits of efficient bearing operation.

PRESSES

Actual day by day maintenance records in some of the country's biggest plants prove the importance of bearings in over-all press maintenance cost. The same records prove the cost advantages of Danly's automatic *circulating oil* lubrication system. Bearings wear longer because they run cooler and cleaner, continuously supplied with the proper amount of filtered oil lubrication.

Routine maintenance is reduced because periodic oiling or greasing is eliminated. The hazard of lubrication failure due to neglect or breakdown is eliminated by automatic safeguards. For the best in presses, come to DANLY.



CIRCULATING OIL TO ALL ANTI-FRICTION BEARINGS

Danly first and second intermediate shaft and drive shaft bearings, indicated in color in this exposed crown view are all anti-friction type, lubricated by filtered circulating oil. Cooler, cleaner operation prolongs life.

DANLY

MECHANICAL PRESSES 50 to 3000 TONS
HYDRAULIC METALWORKING EQUIPMENT

For complete details on outstanding Danly Press features . . . construction, drive, lubrication or operation . . . send for the Double Action Press Catalog today! Danly engineers are at your service.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

It costs less to run a DANLY PRESS!

Single Action Straight Side | Autofeed | Underdrive Single, Double Triple Action | Gap Frame | Double Action Straight Side

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE

You don't waste productive space storing steel!

WHEN YOU BUY STEEL FROM WAREHOUSE, YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

You can turn your present steel storage space into profitable production space—without danger to the continuity of your steel supply. Just use a U. S. Steel Supply warehouse as your own. U. S. Steel Supply can deliver the steel you want to your plant or job site at whatever time you desire. Ask your U. S. Steel Supply salesman to arrange delivery of your steel at *your* convenience—and you'll find your steel arriving with timetable dependability.

U. S. STEEL SUPPLY

DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

FOR PRECISION

PLUS PRODUCTION . . .

PRECIS-O-NIZING

OLD mass production methods are not enough to satisfy a market that is demanding both *quality* and *lower prices*.

Only through modern precision-production techniques can a manufacturer hope to use this two-edged sword to his own advantage!

Because of this need for a productive method of generating precision . . . the Microhoning process was evolved. For a quarter of a century the Micromatic Hone Corporation, working with industry, has led the honing field in the development of equipment that would productively finish parts within the ever-shrinking tolerances of new designs and standards.

This applied precision-adeptness of the Microhoning process is "PRECIS-O-NIZING".

In one economical operation Microhoning abrades stock rapidly and efficiently with a minimum of heat to generate—

—bores that are round and straight
—accurate diametric size
—a functional characterized (cross-hatch pattern) surface finish that is free of smeared or distorted material.

The processing of sewing machine parts is an example of PRECIS-O-NIZING.

Microhoning equipment is available to handle all kinds and sizes of parts . . . from soft non-ferrous metals to hardened steel and special alloys . . . from .078 to 60 inches in diameter and from ¼ inches to 75 feet in length.

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION • 8100 Schoolcraft, Detroit 4, Michigan

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Guilford, Connecticut

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Rockford, Illinois

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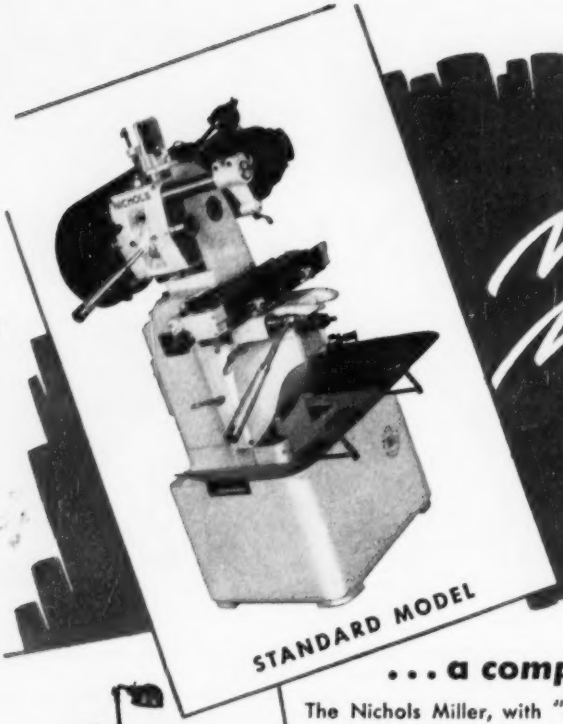
MICROMATIC HONE CORP.
1535 Grande Vista
Los Angeles 23, California

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES: Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado
Hallidie Machinery Co., 2726 First Ave., South Seattle, Wash. • REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

Nichols Miller

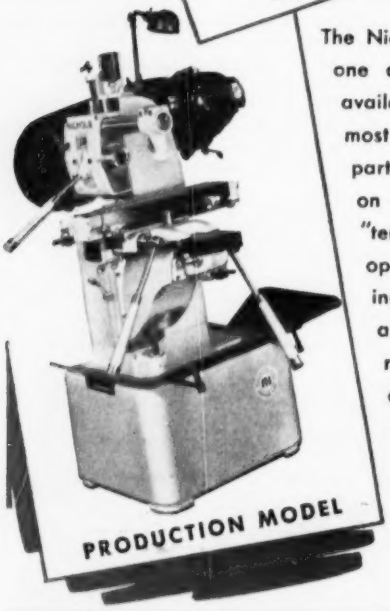


STANDARD MODEL

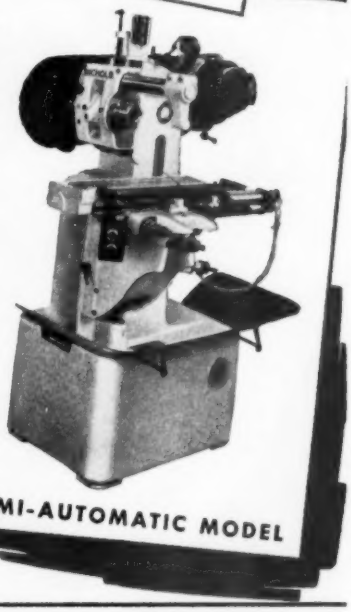
TOOL ROOM MODEL

. . . a complete line

The Nichols Miller, with "rise-and-fall" spindle, is one of the most precise, universal machines available today. The four models shown, fill most basic requirements—whether for single parts with simple set-up, or multiple operations on mass production jobs with tolerances to "tenths". Their versatility makes possible such operations as facing, boring, recessing, turning, slotting, key seating and contour milling, as well as regular milling. According to requirements, screw or lever longitudinal and transverse table feeds are available optionally. "The miller that uses its head" is your best choice—and one of industry's greatest values. If you want production to "tenths", investigate the Nichols Miller.



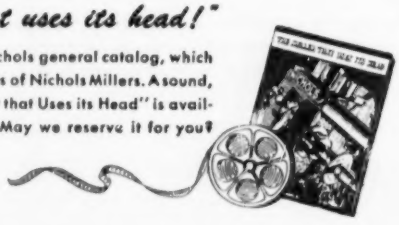
PRODUCTION MODEL



SEMI-AUTOMATIC MODEL

"the miller that uses its head!"

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie "the Miller that Uses its Head" is available for free showing. May we reserve it for you?



CONDENSED SPECIFICATIONS

Table Working Surface	6¾" x 21" or 30"
Longitudinal Travel (screw or lever)	10" or 19"
Transverse Travel (screw or lever)	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION**

76-F MAMARONECK AVE.
WHITE PLAINS, N. Y.

SO SIMPLE

NO PINS • NO PIVOTS • NO BEARINGS

No Wonder There's No Trouble

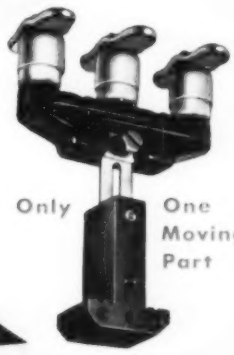
In any device it's the moving parts that are the troublemakers. The more moving parts . . . the more chances for trouble.

Most motor starters have lots of moving parts like pins, pivots, bearings, and linkages. But . . . Allen-Bradley Bulletin 709 solenoid starters and contactors have ONLY ONE MOVING PART . . . the solenoid plunger which carries the movable contacts. No switch could be simpler . . . nor more trouble free. The silver alloy contacts need no filing or dressing. They are always in good operating condition.

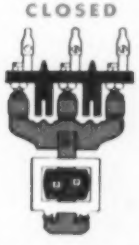
The Bulletin 709 general purpose enclosures, shown below, have a bonderized, black enamel exterior finish that is corrosion resistant. The white interiors make installation and inspection easy in dark places. All switch parts have a "quality" finish. In fact, you cannot buy better "quality looking" control.

Special enclosures are available for every kind of service condition. These across-the-line starters can also be furnished in "open type," without enclosures, for mounting in machine base. Let us send you our catalog!

CONTACTOR OPEN



CONTACTOR CLOSED



Send for Illustrated Bulletin

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

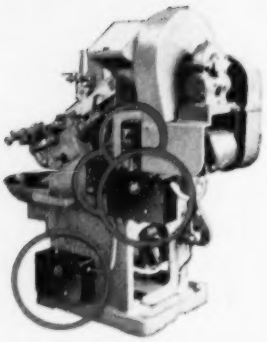
COMPLETE LINE

Allen-Bradley Bulletin 709 Across-the-line Starters are listed for 3-phase motors up to 600 hp, 440-550 v. All starters have accurate relays for overload protection.

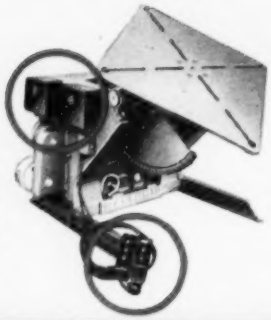
ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

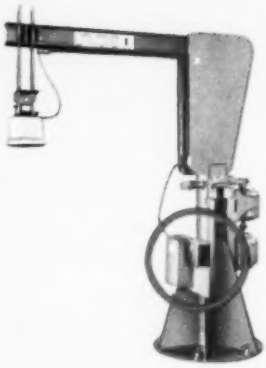
7-53-MR



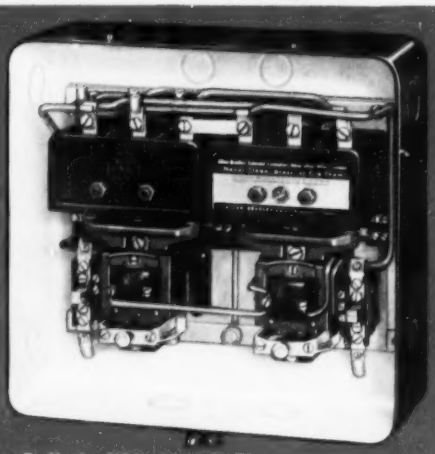
Two Allen-Bradley Bulletin 705 solenoid operated reversing switches on Waterbury-Farrel screw thread rolling machine.



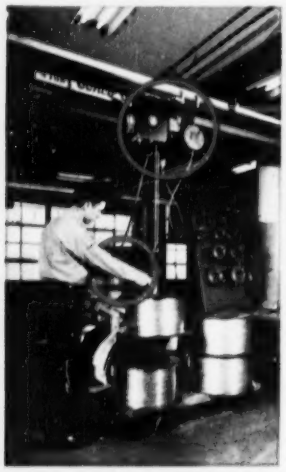
Two Allen-Bradley Bulletin 705 reversing switches on Ransome welding positioner. Push button stations are attached to flexible control cable.



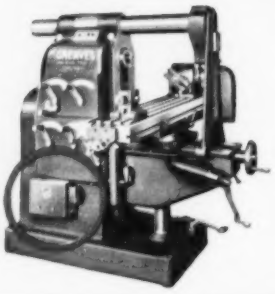
Morris-Wheeler pillar type jib crane equipped with Allen-Bradley Bulletin 705 reversing switch to control the horizontal swing of the crane.



Bulletin 705, Size 2, Reversing Switch.



Bulletin 705 reversing switch on Conco ¼ ton electric hoist for lifting copper wire reels in wire mill.



Bulletin 705 reversing switch for Greaves No. 2 milling machine. Master push button station is at top of the milling machine.

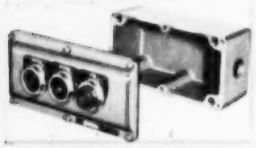
Mercer materials handling hoist equipped with Allen-Bradley Bulletin 705 reversing switch.

TROUBLE FREE REVERSING SWITCHES for 1001 APPLICATIONS

When you have an application for reversing controls, make the installation trouble free by installing Allen-Bradley Bulletin 705 reversing switches. These solenoid operated switches are mechanically and electrically interlocked for complete safety to man, motor, and machine.

Bulletin 705 reversing switches have maintenance-free silver alloy contacts. Accurate and dependable relays protect the motor against overload. Can also be furnished without overload protection. Enclosures are available for every kind of waterproof, dustproof, and explosion-proof service.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. 7-53-R



OILTIGHT CONTROL STATIONS

Bulletin 800T oiltight push button stations for reversing control are available in many combinations of push buttons . . . normally open or normally closed . . . with or without pilot lights . . . in any horizontal or vertical arrangement.

A-B Quality

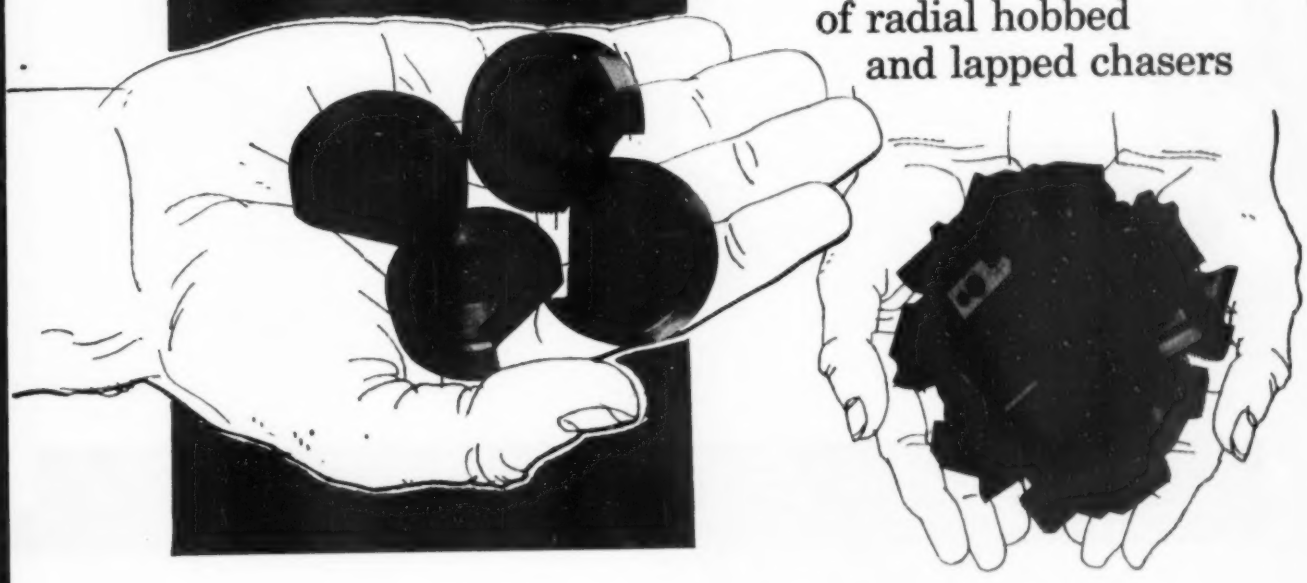
ALLEN-BRADLEY

BULLETIN 705 REVERSING SWITCHES

QUALITY

1 SET of ground thread circular chasers

cuts more threads... than 10 SETS of radial hobbed and lapped chasers



another reason why so many production shops standardize on

VERS-O-TOOL

with GROUND THREAD CIRCULAR CHASERS

With circular ground thread chasers, you grind 200 times and up—to a full 270° of their circumference; with radial type you average 4 grinds.

With circulars, you vary the grind with the right hook and clearance to suit any material; with radials your grind is fixed, usually limited to one material, one job.

With the circular chaser Vers-o-tool System you use the patented Micrometer gauge—every regrind is identical, insuring precise uniformity of threads. You avoid adjustments, scrap loss and save time—reduce your chaser costs 10 to 1 or better, over radial chasers.

Ask for Catalog DT-52

The NATIONAL ACME CO.

170 East 131st St. • Cleveland 8, Ohio.

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

CHALLENGE TO OBSOLESCENCE

By the time you've used up two sets of circulars you will have saved enough to pay for the entire Vers-o-tool installation.

The difference in life and in performance between ground thread circular chasers and the old conventional type as proved in shop after shop enables us to make this guarantee.

24-hour deliveries on most standard stockable NC and NF chasers and blocks—also National taper pipe and dry seal.

Style DS Vers-o-tool (Non-revolving Type) 10 Sizes, ⅜"—6½".

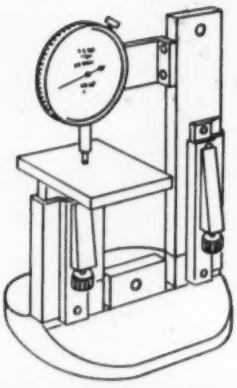
Style DR Vers-o-tool (Revolving Type) 13 Sizes ⅛"—6½"

Style DBS Vers-o-tool (for B&S Automatics) 3 Sizes, ⅛"—⅜".

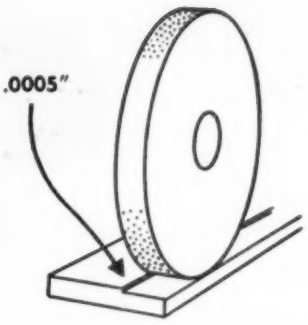
Ground thread circular chasers and their holding blocks are interchangeable, die size for die size, among all styles of Vers-o-tool automatic heads.

CAN YOUR SURFACE

1. Remove .020" from a 2" x 3" piece of oil hardened tool steel using a .020" automatic crossfeed at each end of the stroke —material to Rockwell 59-60 C scale.



2. Remove the work and measure its thickness. For extreme accuracy use DoALL Gage Blocks with Micro-Step accessories or electric comparator.



3. Put the work back on the machine and zero the elevating hand wheel (slip rings on the DoALL hand wheels make this a quick, easy job.) Now set the hand wheel to .0005" and cut across ⅓ of the work.

New DoALL Precision Surface Grinders Establish New Standard of Performance

THE test described above is just one of several that prove the accuracy, rigidity and matchless performance of DoALL Surface Grinders.

There is no give, no wheel ride-up, no play in a DoALL Grinder. Accurate duplication of parts, time savings and elimination of spoiled pieces are the advantage of true precision work. With a DoALL Surface Grinder your operator will not have to remove the work from the chuck and measure it for size. The DoALL Grinder will accurately produce parts to a predetermined tolerance from the hand wheel setting.

Surface grinding is often the *starting point* for accurate work and generally the *finishing point* when close tolerances are required. There is no substitute for perfection in surface grinding—can your grinder pass the DoALL test?

Proof of these claims can be yours without cost or obligation. Simply ask for a free demonstration. Operate a DoALL Surface Grinder in your plant, on your own work, and see how precision grinding will reduce operating costs.

Call your local DoALL Sales-Service Store, or write:

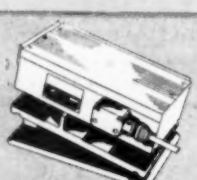
THE DoALL COMPANY

254 N. Laurel Avenue **Des Plaines, Illinois**

CR-9

BAND MACHINES

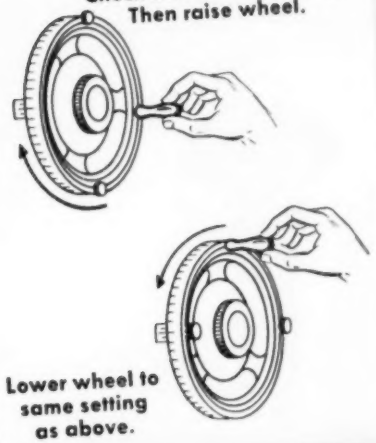
MAGNETIC CHUCK



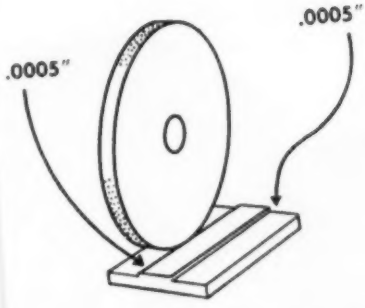
SINE CHUCK

SELECTRON

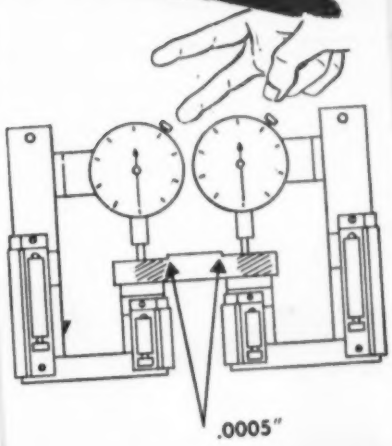
GRINDERS DO THIS?



4. Check the hand wheel setting, then raise the grinding wheel. Now move the work piece to the opposite side and lower the grinding wheel to the exact setting of the preceding cut.



5. Now take another cut across ⅓ of the work on the surface opposite the first cut. The resulting cut should be precisely the same if your grinder is capable of accurate duplication.



6. Prove it! Measure three points in each cut with precision measuring instruments. If you make this test with a DoALL Grinder you'll find the work is perfect—the cuts are exactly the same depth!

New Models . . . New Sizes DoALL Surface Grinders for TOOLROOM and PRODUCTION Work

•

Patented Cool Grinding Time Saving Accessories

D-6 Models—6" x 18" and 6" x 24" sizes. Manual and hydraulic operation. 7" wheels.

D-8 Models—8" x 24" with 10" or 14" wheels. Manual and hydraulic operation.

D-10 Models—10" x 30" with 10" or 14" wheels. 12½" work height capacity, all models.

Table travel speed up to 100 fpm.

Available with new recirculating "Cool-Grinding" System.

Complete line of attachments and accessories for surface, cylindrical and form grinding.

Model D-10 Grinder with complete automatic, electric remote control system.

Write for NEW Catalog

DoALL

We have just one axe

CARBO

TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.

to grind . . . YOURS!

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

Take snagging, for instance. With abrasives there are at least 9 different ways to remove stock at high rates. That means the odds are 9 to 1 there's a better, lower cost way than the one you're using now. How can you be *sure?* By asking CARBORUNDUM . . . for CARBORUNDUM alone has a complete, branded line of grinding wheels *and* abrasive belts *and* tumbling and polishing grains . . . and only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or suppose you're manufacturing shears . . . you must remove scale with tumbling nuggets—finish with abrasive belts—sharpen with grinding wheels—polish with abrasive grain. CARBORUNDUM alone can give you *one-source control* of abrasive quality, on every type of abrasive you use . . . quality that's constant, identical, dependable—thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery . . . and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

Ready now—your free copy of the new big COATED ABRASIVE SELECTOR catalog . . . containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today.

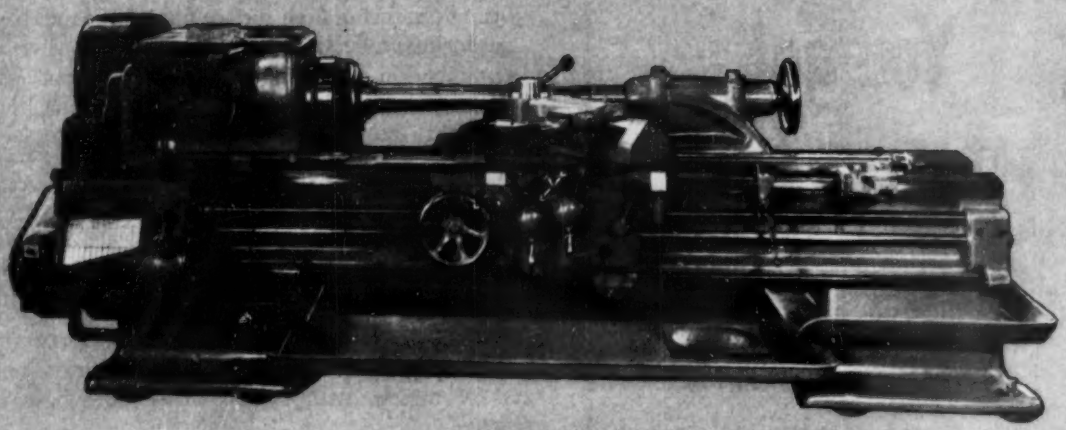
RUNDUM

MARK

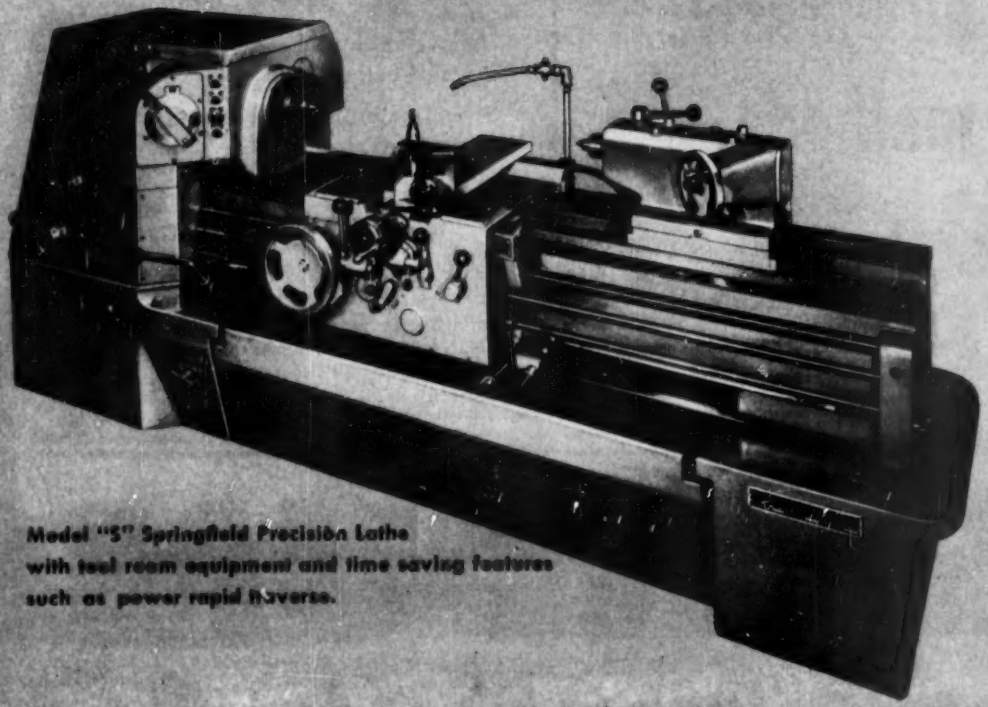
. . . the ONLY source for EVERY abrasive product you need

SPRINGFIELD

TURNING—CONTOURING—PROFILING—ENGRAVING—



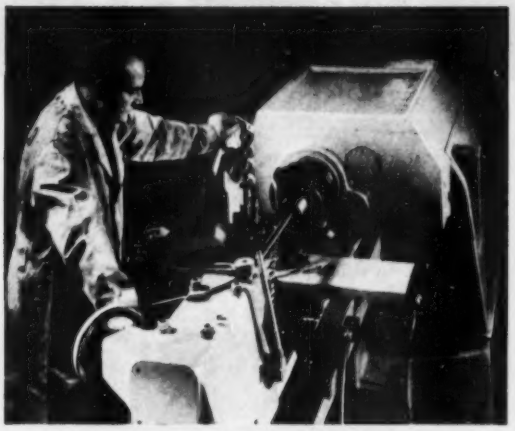
Model 180 Springfield Precision Lathe with Hydraulic Contouring Attachment for economical production of turning, boring and facing operations involving contours.



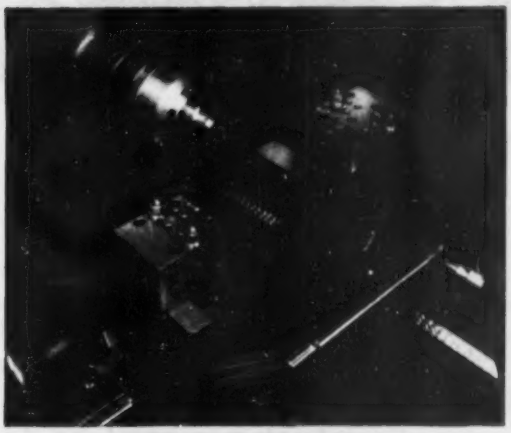
Model "S" Springfield Precision Lathe with tool room equipment and time saving features such as power rapid traverse.

LATHES

REPRODUCING — BORING — THREAD CHASING — RELIEVING

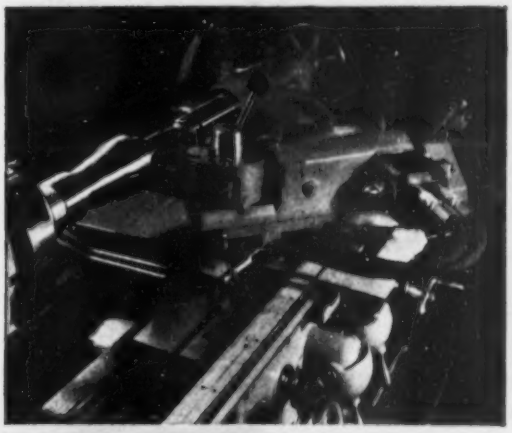


EFFORTLESS OPERATION



CUSTOM TOOLED

INTRICATE REPRODUCTION



PRODUCTION CONTOUR TURNING

Write for Catalog

THE SPRINGFIELD MACHINE TOOL COMPANY

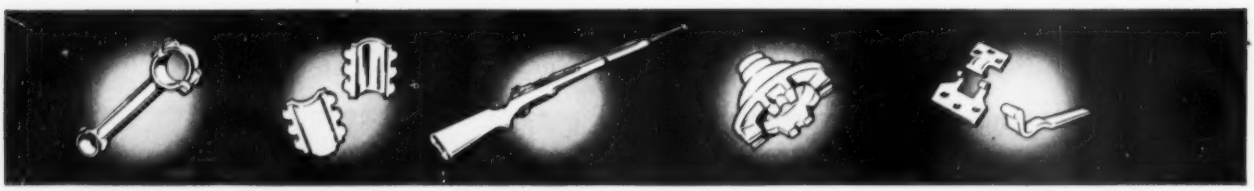
SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

1 The year 1933 marked many automotive design and production advances. Among those on the production front was the first Detroit Broach tooling to broach connecting rods . . . an important advancement in terms of increased production, lower costs and better quality . . .

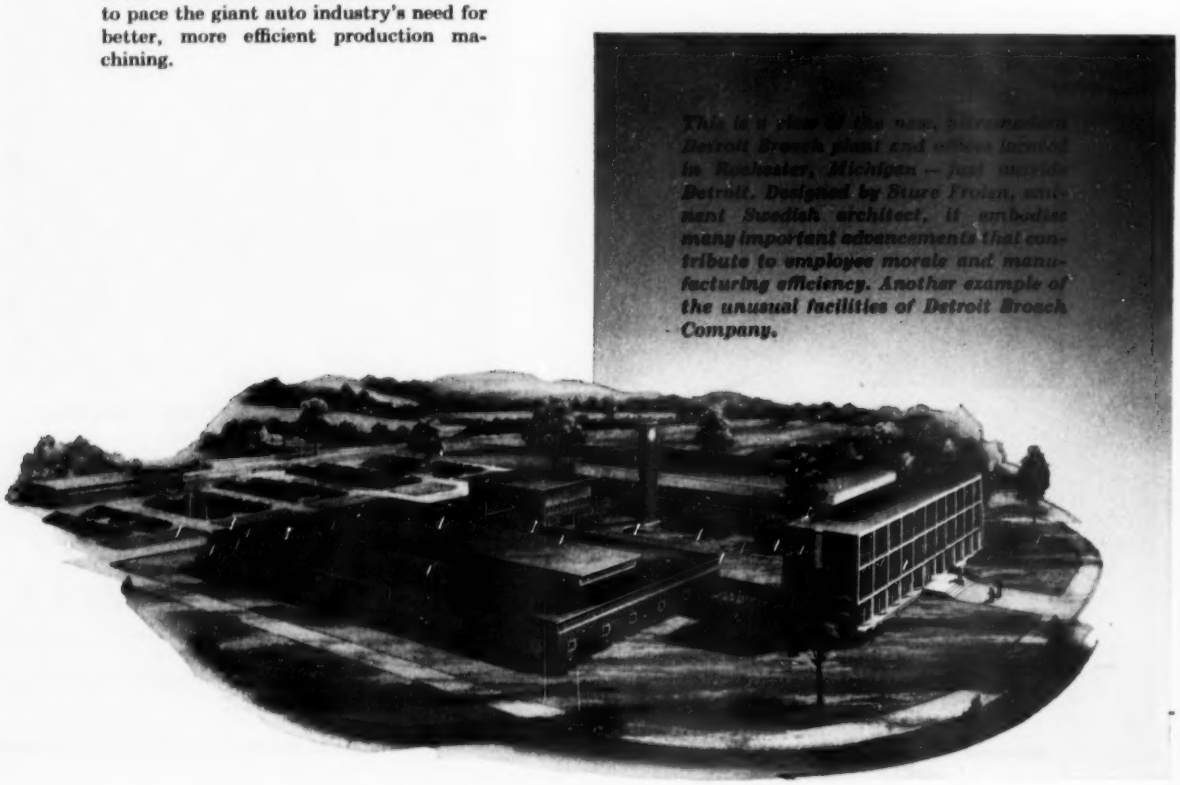
2 During the later thirties Detroit Broach continued to contribute to automotive broaching advancements. One example in 1938 was Detroit Broach tooling which made possible the complete finishing of main bearing caps cast in one piece in two passes . . .



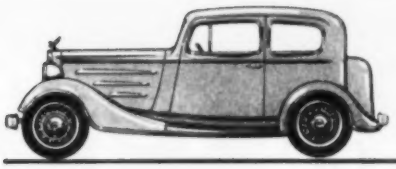
3 In the war years, the auto industry turned to war material and to Detroit Broach for the broach tooling for hundreds of parts. Typical was broach tooling to produce the rifling in gun barrels in a single pass and multiple-surface broaching operations on other gun parts . . .

4 Detroit Broach has continued to serve the auto industry in the post-war years. Tooling to broach differential cases, hinges, automatic transmission parts and innumerable other parts is helping to hold the line on rising production costs.

TODAY, automation has been introduced by Detroit Broach as an integral part of broach tooling. Parts are fed to, and carried away from, automatic broach tooling by specialized conveyor and hopper equipment. Tomorrow, too, one thing is sure . . . Detroit Broach will continue to pace the giant auto industry's need for better, more efficient production machining.

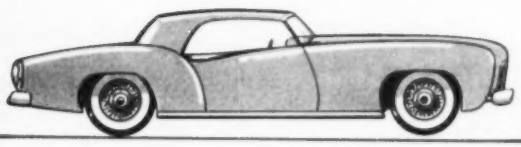


This is a view of the new, 50-acre Detroit Broach plant and offices located in Rochester, Michigan — just outside Detroit. Designed by Sture Frolen, eminent Swedish architect, it embodies many important advancements that contribute to employee morale and manufacturing efficiency. Another example of the unusual facilities of Detroit Broach Company.



Broaching Pioneers

IN THE AUTOMOTIVE INDUSTRY



Master of mass production techniques, producing at a level where pennies per piece mean thousands of dollars per year, the automotive industry was among the first to recognize the economies of broaching.

Early, too, came recognition of Detroit Broach ingenuity and reliability in the design and manufacture of tooling that would pace production requirements. A small sample of that tooling is shown at the left.

in YOUR industry, too you will find many companies who rely on Detroit Broach to meet their needs for tooling that slashes cost-per-piece, boosts output and provides consistent and repetitive top-notch accuracy.

Detroit Broach engineers, Detroit Broach facilities, in fact the entire Detroit Broach team, are all keyed to one specialized skill. That skill is broaching. It is such specialization that has resulted in many of broaching's greatest advancements.

It will pay you, too, to have a talk with the Detroit Broach representative in your area. You will doubtless find many ways to lower the boom on rising production costs on present as well as proposed operations.

Detroit Broach **COMPANY**

3164

ROCHESTER, MICHIGAN

Offices in Principal Cities Throughout the World

Industry reports pouring in prove...
"Positively giving us 2 to 3 times longer cutting life on tough Stellite alloy rough castings and forgings."
Toolroom Supervisor
Machinery Manufacturer
"We were getting 250 pieces per grind of our tool. Since installing the Fenlind machine with BEHR-MANNING belts, we have raised this to 1000 pieces per grind."
Plant Superintendent
Machinery Manufacturer
"Cutting 4340 material, we were getting one piece per tool. Now three pieces per tool with new Belt Method."
Tool Engineer
Aircraft and Automotive Parts Mfg.
"On tools used for cutting through scale on rough castings, we have obtained five times the normal cutting life by finishing with BEHR-MANNING Belt Method."
Superintendent
Forge Works

Carbide tool life greatly extended

WITH BEHR-MANNING

ABRASIVE BELT SHARPENING METHOD!

Behr-Manning Micro-Finishing DURITE® Paper Belts with the Fenlind Micro Finisher not only give Carbide Tools a superior cutting edge, but also lower finishing costs by saving the expense of diamond wheels.

HERE'S THE COMBINATION THAT DOES IT

NORTON CRYSTOLON® WHEEL
39C60-18VK (Roughing Wheel)

FENLIND MICRO FINISHER
Model 13 (Pat. Pend.)

BEHR-MANNING SPEED-WET® DURITE®
Paper Carbide Tool Finishing Belts

● No unsupported claims or limited laboratory tests. Here are a few of many actual reports received from the severest and toughest possible "proving grounds" — the plants of American Industry! Since December, 1952, when this carbide tool finishing method was first introduced by Behr-Manning and the Fenlind Engineering Co., plant after plant has put this method to the test and "given it the works" in its toolroom.

The results have been spectacular. One large electric machinery manufacturer, after trying one Fenlind machine with Behr-Manning belts, now uses *thirty* in 9 different plants! An automotive manufacturer installed one Fenlind machine and followed up with an order for a dozen! In plants large and small the reaction is the same — the BEHR-MANNING® Belt Method gives carbide tools a superior edge.

If you haven't tried this new method you are missing a proven way to cut your toolroom costs. See for yourself. Check with your BEHR-MANNING Distributor or make a date with your local BEHR-MANNING Demonstration Room.

Behr-Manning Corp., Troy, N. Y., Dept. AM-9.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

BEHR-MANNING® CORPORATION *division of NORTON Company*

▲ COATED ABRASIVES ▲ SHARPENING STONES ▲ PRESSURE-SENSITIVE TAPES

G-4

For the newest in coated abrasives...watch Behr-Manning!

are you Losing Time turning jobs like these?

SUNDSTRAND Automatic Lathes increase production on both short-run and mass production turning . . .

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only three of the many users of this modern equipment. All of the advantages of multiple-tool turning are available on *both* short-run and mass production work. Study these brief examples and compare the production figures with parts similar to yours . . . then get the whole story for equivalent or better savings on turning work in your own plant.

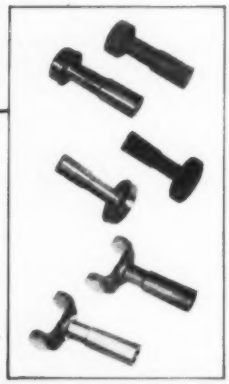
Production increased 2½ times on lot sizes of 100 to 500 parts . . .

Parts are pump rotors and covers. Previously these parts were turned on three conventional turning machines using three operators. A Sundstrand Model 8A Automatic Lathe does the same work 2½ times faster with one operator. Operations include facing, turning and core drilling. Production on cast-iron parts is 120 per hour.

13 hours saved on each lot of 20 impellers

Parts are bronze, range in size from 4" to 10" in diameter. Parts were formerly machined in three operations and three set-ups in 15 hours. Same amount of machining is done in two set-ups on Sundstrand in 2 hours. Turning convex and concave shapes and boring center hole comprise operations.

Production increased 70% on 12 different jobs



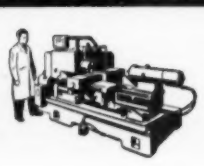
Here are "before" and "after" illustrations of three of 12 different turning jobs on a Model 12A Automatic Lathe. Operations include turning, facing and chamfering. Production increases average from 65% to 70%.

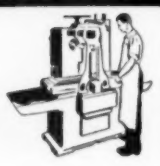
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

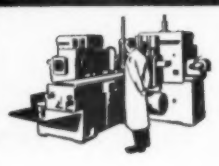
SUNDSTRAND

*"Engineered Production" Service**

*REG. U.S. PAT. OFF.





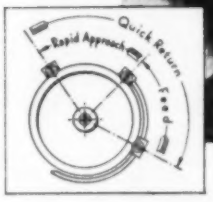


These exclusive features make it possible to obtain this higher production

Seven machine design features govern the possibility of turning short-run work on Automatic Lathes otherwise limited to mass production turning only. They include (1) Wide range of carriage cycles, (2) Adequate feeds and speeds, (3) Quick cycle change, (4) Simplicity of adjustment, (5) Adequate power, (6) Automatic cycling and (7) High rapid traverse rate. Sundstrand Automatic Lathes have all seven. One of the most important of these is:

Wide Range of Tool Action

Straight feed-in type carriage with slow up and dwell and tool relief provides wide range of action for front tools. Many cycle combinations are possible by merely making simple adjustments.
Another important feature is:

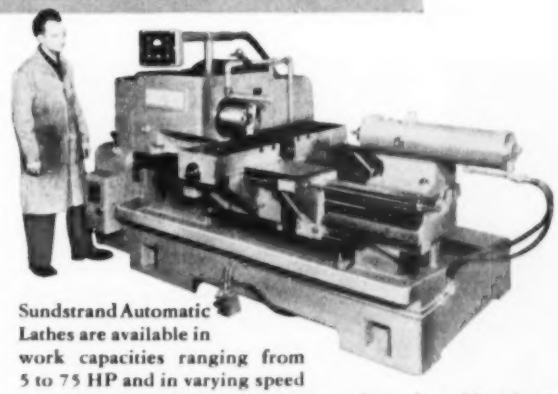


Quick Cycle Change for Faster Set-ups

Complete control of all cycles is provided by adjustment of dogs on a disc as shown in above illustration. Making cams is eliminated. Changing position of dogs on disc changes length of rapid approach, feed and rapid return stroke — enables operator to set up cycle quickly and change over from one job to another easily.

Let Sundstrand Engineers help you select the proper Automatic Lathe to suit your work

Let our engineers assist in the selection of the proper automatic lathe for your job, and make tooling suggestions for faster turning of *both* short and long-run work. This competent staff of engineers is available to study your problems and suggest changes for increased production, lower costs. Send complete, accurate information with each inquiry.

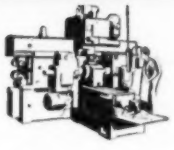


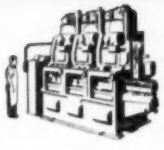
Sundstrand Automatic Lathes are available in work capacities ranging from 5 to 75 HP and in varying speed combinations and lengths. Shown above is a Model 12A Automatic Lathe with 50 HP spindle drive motor.

FREE DATA:

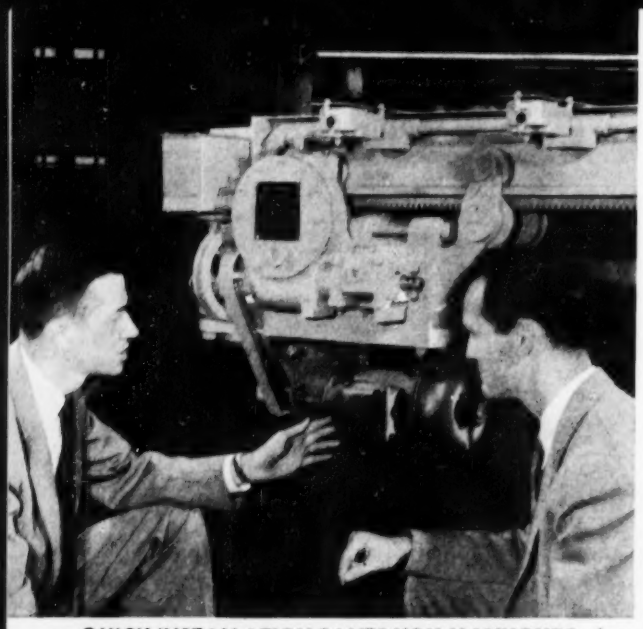
Complete information on Sundstrand Automatic Lathes can be obtained from these booklets. Ask for bulletin 135.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.



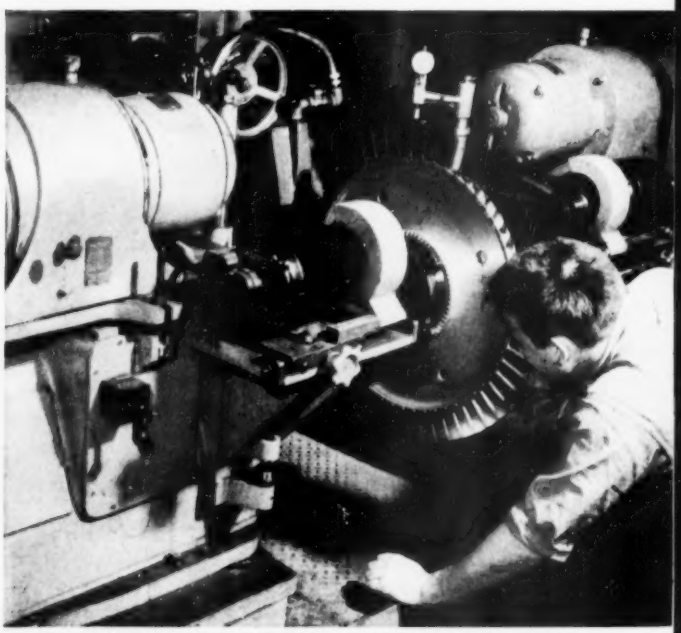
1 QUICK INSTALLATION SAVES YOU MANHOURS when G-E gear-motor is used on compact machines like this soot blower for power plant equipment. Neat, packaged construction permits quick, easy installation in limited space.

2 SIMPLE MAINTENANCE SAVES YOU MONEY. If electrical maintenance is ever needed on this G-E Tri-Clad gear-motor—driving scraper in a grannery—3-piece design will permit stator removal without disturbing gear train.

Save 4 Ways with G-E TRI/CLAD Gear-motors

REG. U.S. PAT. OFF.

3 PROMPT DELIVERY SAVES YOU TIME—assures you of getting the gear-motor you need when you need it. A new multiple point stock plan permits one-week delivery on more than 300 models of General Electric gear-motors.



4 THE "RIGHT" GEAR-MOTOR SAVES YOU TROUBLE on precision operations like grinding jet engine bucket blades. General Electric's wide selection assures you of the correct gear-motor for your particular low-speed application.

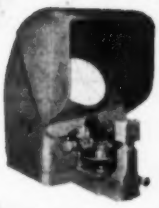
For more information about G-E Tri-Clad gear-motors contact your nearest G-E representative, agent, or distributor, or write to General Electric Company, Section 755-12, Schenectady 5, N. Y. for your free copy of new Bulletin GEA-1437H.

GENERAL ELECTRIC

11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models

Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

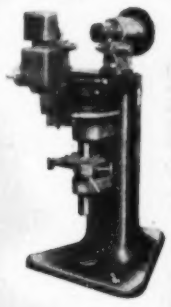
JONES & LAMSON OPTICAL COMPARATORS

The Essence of Quality Control

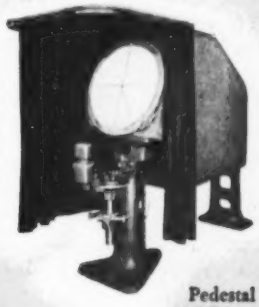
Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen



Direct
Projection
Type



Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
502 Clinton St., Springfield, Vt., U.S.A.

COMPARATOR DIV.
Dept. 710

Jones & Lamson Machine Company
502 Clinton Street, Dept. 710
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

THIS NATIONAL ACME MARK

on Collets & Pushers

USED IN ACME-GRIDLEY AUTOMATICS...

is your best insurance of

- positive gripping power
- ease of adjustment in use
- uniformity of heat treatment
- precision grinding and gauging

Some salesman may offer you a "trick design" in collets, another will claim his "just as good as." Or you may even hear "we make all these for National Acme." Don't fall for it.

The plain facts are these—GENUINE National Acme branded Collets and Pushers are made only by and are available only from the original builders of Acme-Gridley Multiple and Single Spindle Automatics—and for no other machines.

This Company assumes the same responsibility for the high performance of its Collets, Pushers and other stock feed components as it does for the machines to which they are engineered—more than 45,000 Acme-Gridleys in use.

If a Collet proving a better performance record could be found (we've looked at dozens of them) we would adopt it and it would proudly bear our brand name.

Fact is, every month a higher percentage of Acme-Gridley owners who have experimented are returning to their logical Collet source—convinced that nowhere else can they get so much for their Collet and Pusher dollar. So next time you order, remember—

Write for Catalog CP-49A

genuine ACME-GRIDLEY COLLETS AND PUSHERS ARE MADE ONLY BY AND ARE AVAILABLE ONLY FROM...

The NATIONAL ACME COMPANY

170 EAST [illegible] STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle —Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.

BULLARD

MANUFACTURERS OF MACHINE TOOLS

Chance Vought Twin-Jet Cutlass

United Aircraft Corp. Photo

The Invisible Background of Industrial Progress

Faster than sound — United Aircraft's Chance Vought F7U-3 Twin-Jet "Cutlass" fighter plane is designed to out-fly and out-fight any other carrier-based fighter in the world. Its reputed performance is a credit to the ingenuity of its designers and manufacturers of its jet propulsion equipment.

★ The Bullard Company, builders of *Modern Machine Tools*, are proud to have contributed to "The Invisible Background of Industrial Progress" resulting in the success of this fighter — a part of America's first line of defense.

Whether you have small job lots or mass production, we can show you how Bullard Machine Tools can add to your production speed and economy.

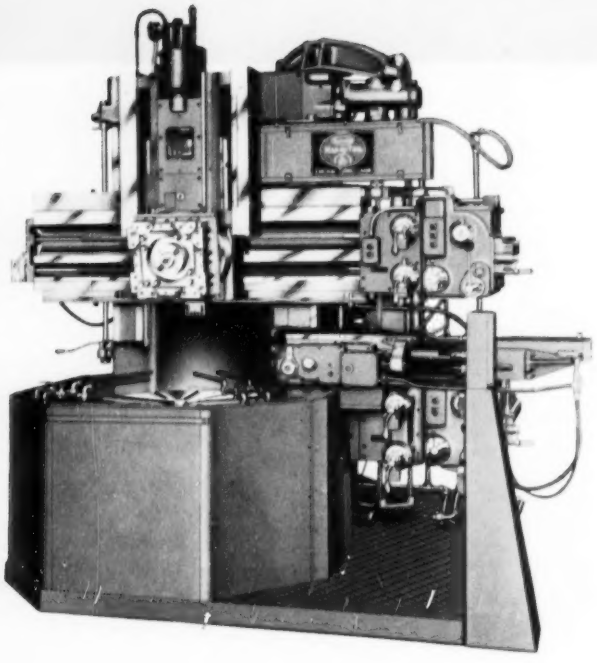
★ *For greater manufacturing economy REFER to next page.*

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY

The production of jet engine compressor cases on the Bullard Man-Au-Trol Vertical Turret Lathe is one of the many applications possible for this versatile machine tool.



The machine is ruggedly constructed with "built-in" rigidity to insure accurate machining time after time. It may be operated manually by the operator for small runs or automatically by the Man-Au-Trol for mass production. Whatever your need this machine is flexible in its characteristics to fulfill your exacting requirements.

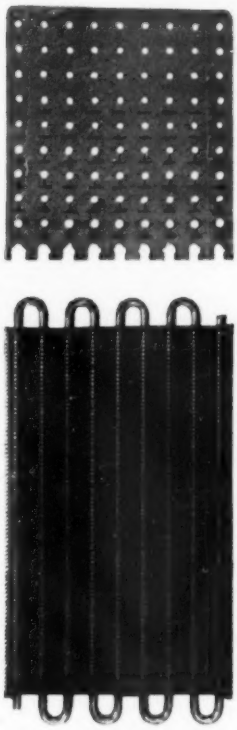
Let Bullard engineers submit a survey on your specific requirements.

BULLARD

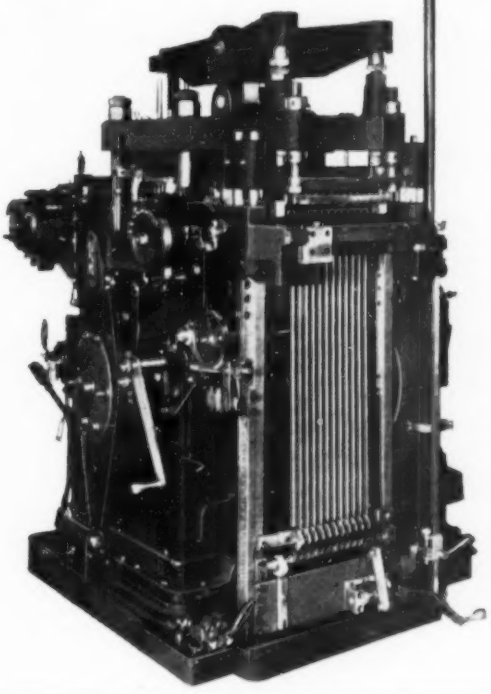
Time saved is money earned. Write now for information on Bullard Man-Au-Trol Vertical Turret Lathe.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

this condenser "assembled for nothing"



Henry & Wright 50-ton Dieing Machine With Special Assembly Unit



Henry & Wright Dieing Machine stamps out fins and then fits them onto tube at high speed . . .

This single Henry & Wright Dieing Machine does the work of several ordinary presses and a benchful of assemblers. First, the fins are partially completed via progressive stamping, at the rate of 120 strokes per minute. Next, the fins are fed onto the serpentine tube, fitted and cut off from the strip. The operator simply removes completed core and puts a new tube in the assembly fixture.

Combining high speed with long die life, the Henry & Wright Dieing Machine provides a production tool basically designed for new and improved methods. From simple blanking to complex operations, you can count on a price cut with every stroke.

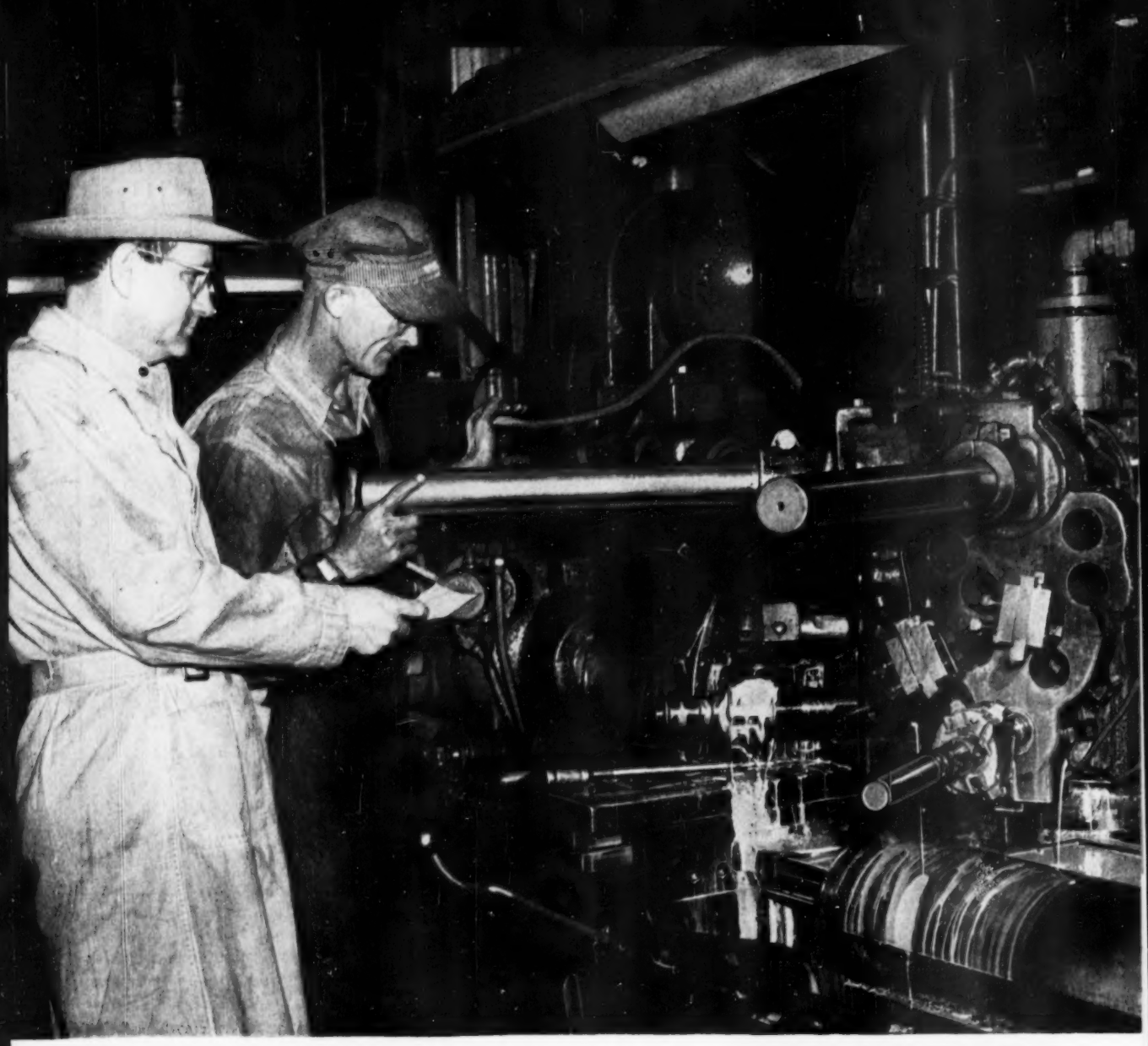
LATEST CATALOG

See how you can use Henry & Wright Dieing Machines to modernize your operations. Write Henry & Wright, 481 Windsor St., Hartford, Connecticut.

Only the best is good enough

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.



Four Wheel Drive Auto Co. benefits 4 ways with ⟶

SUPERLA
REG. U. S. PAT. OFF.
Soluble Oil

• Over a period of nearly 40 years, the Four Wheel Drive Auto Co., Clintonville, Wisconsin, has used SUPERLA Soluble Oil on an increasing variety of machining jobs. Shown above is a current operation performed on a semi-automatic turret lathe. The job calls for boring and turning of 1040 steel to produce differential case assemblies.

Company officials report that on this job, as on many other jobs employing milling machines, drill presses, and grinding machines, SUPERLA Soluble Oil has provided these four important benefits: **1.** Mixes readily with cold water. **2.** Forms stable emulsions. **3.** Helps hold close clearances and dimensions. **4.** Helps provide good finish and tool life.

The long and successful experience of the Four Wheel Drive Auto Co. with SUPERLA Soluble Oil testifies to the benefits you can obtain with this outstanding coolant.

The Standard Oil lubrication specialist serving your area of the Midwest has a complete line of metalworking fluids and compounds to offer you. He also has the experience and training to help you use these products most effectively. You can reach this man by phoning your local Standard Oil (Ind.) office. Or write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

What's YOUR problem?

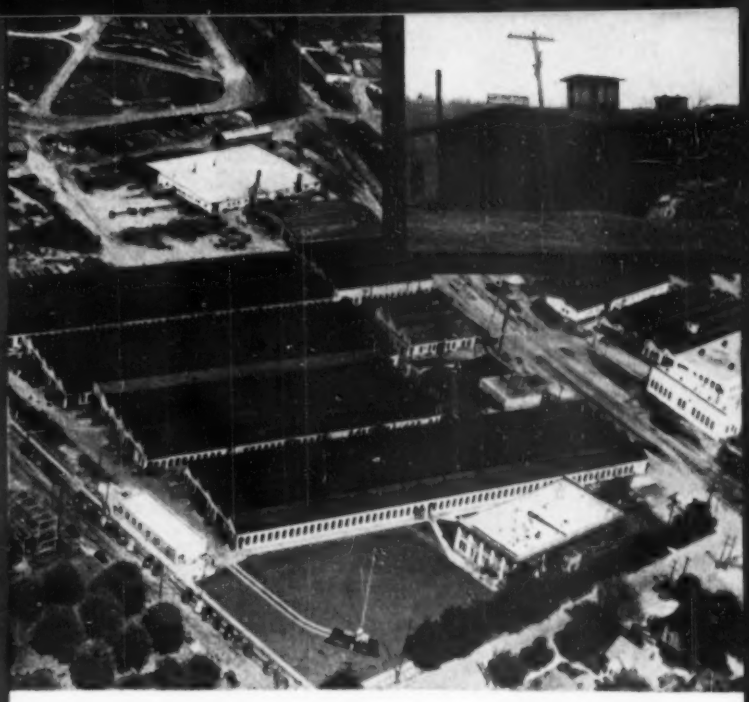
R. E. O'Brien, of Standard Oil's Green Bay office, is the lubrication specialist who works closely with the Four Wheel Drive Auto Co. to assure maximum benefits from the use of SUPERLA Soluble Oil.

He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert and thorough attention to your lubrication problems.

A phone call to your local Standard Oil Company office will bring this man quickly to your plant—with no obligation to you, of course.

STANDARD

STANDARD OIL COMPANY
(INDIANA)



Nothing succeeds like service!

These illustrations, contrasting the past with the present, show dramatically the progress made by the Four Wheel Drive Auto Company since its organization in 1910. Service to the nation, through two world wars and in an era of great growth and progress, has won an impressive success for this company. Service, too, has won for Standard Oil an acceptance by the Four Wheel Drive Auto Company that now extends over a period of nearly 40 years.

Another typical

Morris

MOR-SPEED

production machine

performance record

35% SAVINGS IN LABOR

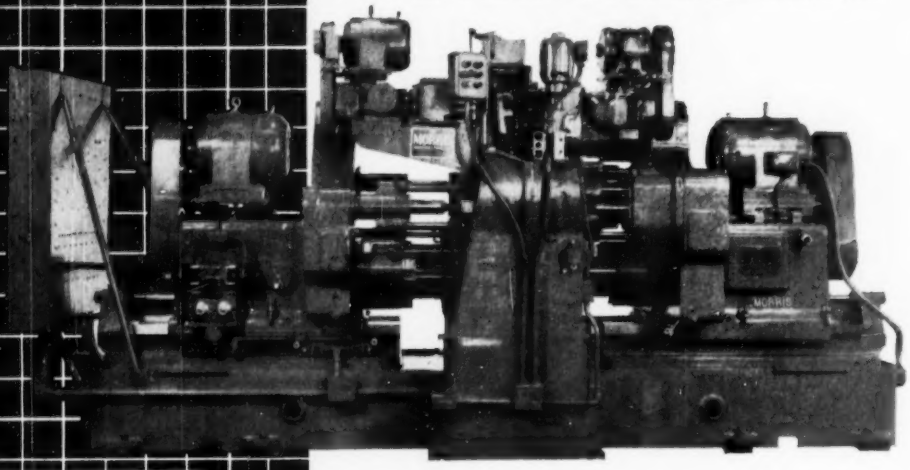
REPLACES 6 OLDER MACHINES

PAYS FOR ITSELF IN 9 MONTHS

The two way horizontal, eight station, automatic indexing machine illustrated drills, reams, countersinks, forms radius and taps 187 refrigeration unit cylinders per hour.

This unit is equipped with nineteen drilling spindles, fourteen countersinking spindles, four counterboring spindles, one reaming spindle and eleven tapping spindles. Twenty spindles are in the left hand head and eighteen in right hand head.

If your work requires numerous operations on a mass production basis, consult us. Our engineers are eager to serve you.



OPERATIONS PERFORMED:

Drill, countersink and tap 8,—¼"—28 tap holes

Drill, ream and chamfer both ends of 1⅛" hole

Counterbore for ⅝" dia. segment

Drill, countersink and tap 1—$\frac{8}{32}$ tap hole

Drill, countersink and tap 2—⅜—24 tap holes

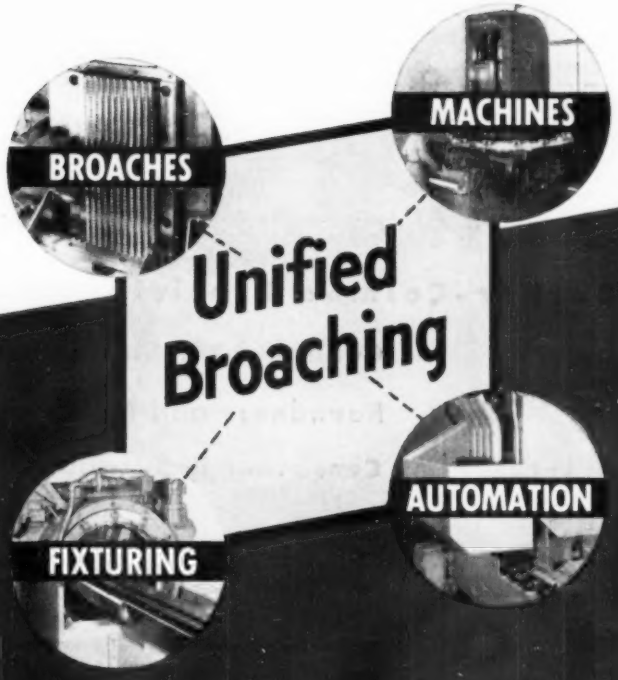
*Refrigeration Unit Cylinder

Builders of MOR-SPEED Tools

Morris **THE MORRIS MACHINE TOOL CO.**

933 Harriet Street, Cincinnati 3, Ohio

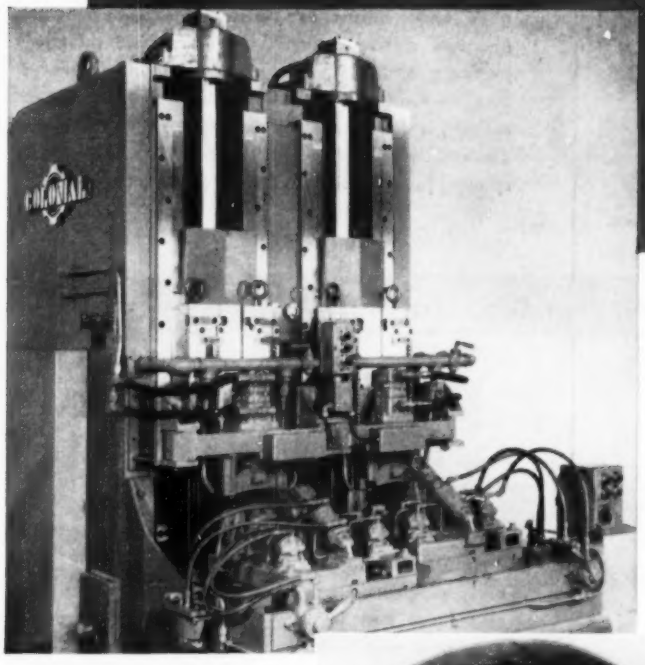
"A Better Product at Less Cost with PRECISION PLUS PRODUCTION."



the COLONIAL method

At Colonial, experience, imagination and competence are applied

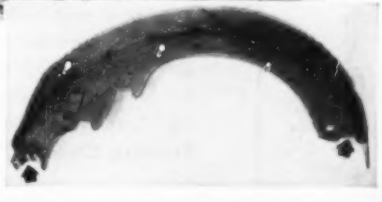
1. to the design and manufacture of each of the individual components of a complete broaching installation, and
2. to the effective combining of ALL components into a completely UNIFIED BROACHING installation—making them work as a "team."



400 Brake Shoes Broached per Hour

Here a 1/2-inch slot and a 13/32-inch concave are broached at opposite ends of 400 brake shoes per hour. Stock removed is 3/32-inch.

Colonial provided instantaneous pneumatic positioning; automatic hydraulic clamping; two shuttle fixtures; uniform taper insert broaches—all unified on a Colonial dual ram with 54-inch stroke.



WHAT'S AHEAD IN BROACHING?

Keep up with the latest developments: Read "Broaching News". We will be glad to see you get it regularly if you will drop us a line on your company letterhead.

PIONEERS OF H.S.S. BROACHING

COLONIAL BROACH CO. DETROIT 13

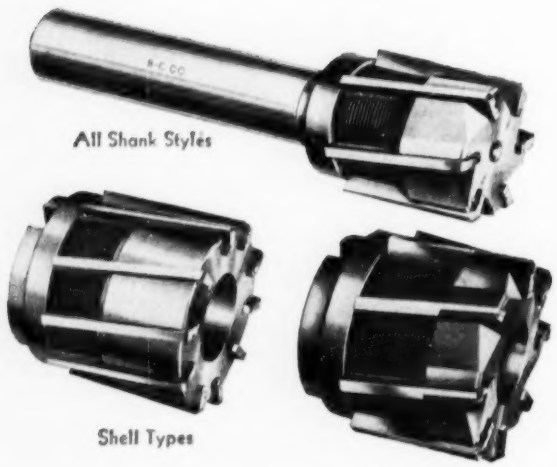
Cut REAMING COSTS

Barber-Colman Precision Reamers

Control Size, Straightness,

Roundness and Finish with

Consistent Duplication



Inserted Blade Reamers

Barber-Colman Inserted Blade Reamers feature low cost blade replacement, easy adjustment for re-sizing and unusual blade strength for precision high production reaming. Simple pin and wedge design allows more blades per reamer diameter for better, smoother cutting action. Blades are held solidly in perfect diameter, avoiding any possibility for variation in roundness or straightness. Adjustment for resizing is easily and quickly made, with size readily checked across any two blades. Irregular blade spacing provides smooth cutting action and fine finish.

All Styles in HSS or Carbide Tipped

Solid-Fluted Reamers

For small diameter holes, Barber-Colman Solid-Fluted Reamers provide maximum flute strength, quick chip disposal, precision control of roundness and size — and finish that in many cases eliminates lapping. Maximum chip clearance with strongly supported cutting edges provides rigidity and free cutting action for reaming holes to extremely close tolerances. All basic styles and types are included — Precision Jig Boring, Expansion, Taper Reamers, Oil Feed Reamers, Chucking Reamers and Solid Line Reamers.

These features mean better, faster results, with less cost per hole machined. Ask Barber-Colman reamer engineers to assist on your reaming jobs, or send tool and part prints for recommendations.

Custom Built to Fit Special Reaming Problems—

Years of experience in testing and designing reamers for maximum performance under a variety of conditions have permitted Barber-Colman engineers to specialize in the manufacture of custom tools to fit special reaming problems. Tools are designed for special conditions of size, finish, tool life, production, or to adapt a reamer to a particular part or machine. Cutting flute profiles, clearance angles or flute design are applied to meet the specific condition.

Reamer Sharpening

Barber-Colman reamers are sharpened by conventional methods on any standard cutter sharpener. For easier sharpening, with positive mechanical duplication of cutting form and clearances, Barber-Colman also offers the Automatic Reamer Sharpener. This semi-automatic method of precision sharpening is particularly desirable for high production reaming applications to assure hole-to-hole consistency.

Get This New Reamer Service Handbook

Complete with Technical Data on Design Factors, Driving and Holding Equipment, Operating Speeds, Feeds and Coolants.

Shows How To Obtain Better Reamer Performance. Guide for Proper Care and Maintenance.

Available without Charge to all Production Executives when Requested On Company Letterhead. Address Barber-Colman Reamers — Dept. 919.

More than 25 years of practical reaming experience is available without cost when you use Barber-Colman reamers. This experience enables you to get maximum job performance on your specific reaming requirements with low costs per reamed hole. Check your reaming operations and consult with Barber-Colman Engineers.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 819 ROCK STREET, ROCKFORD, ILLINOIS

Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

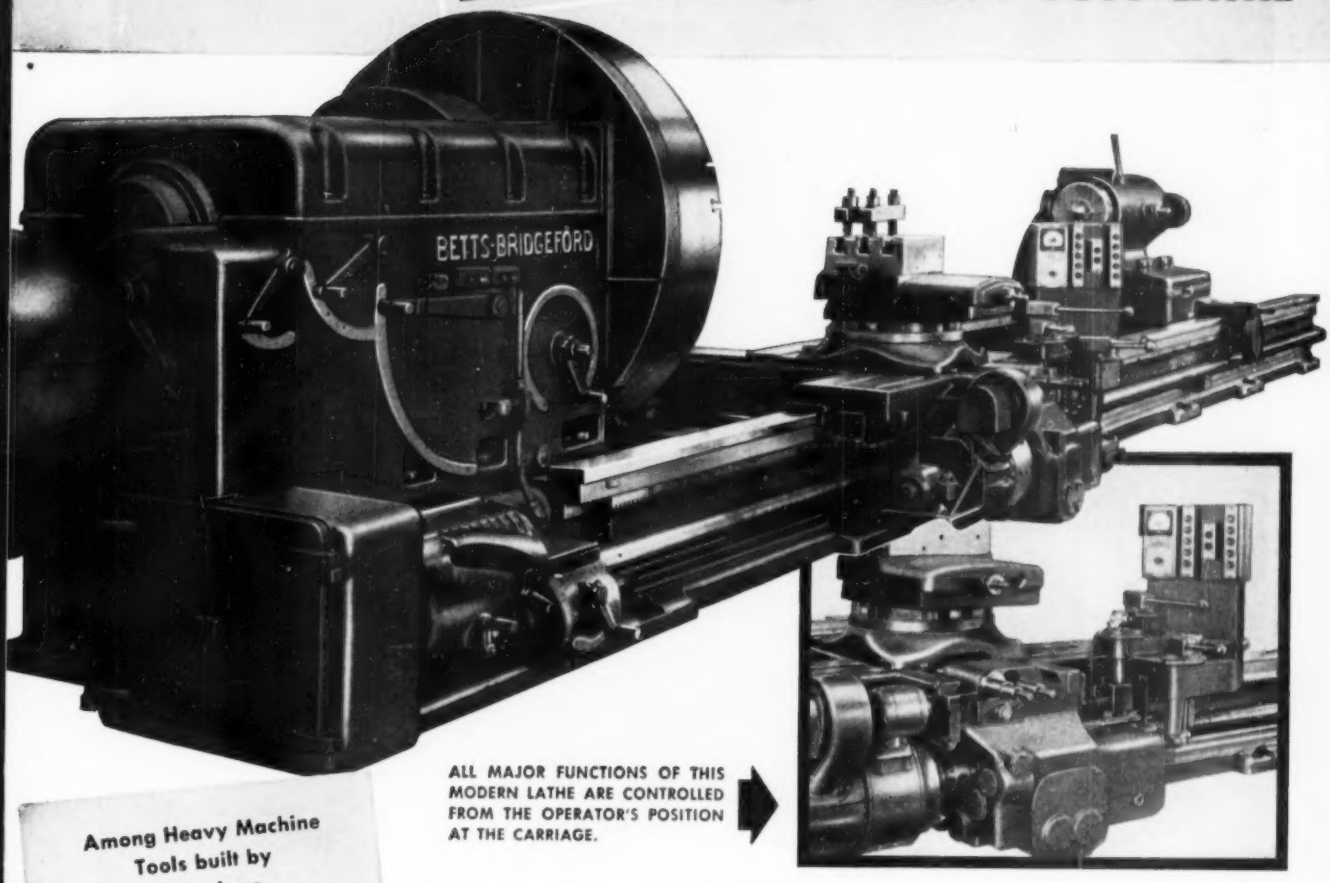
PUT IT ON THE **BLANCHARD**

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

BETTS-BRIDGEFORD

ELECTRONIC FEED

60" HEAVY DUTY LATHE



ALL MAJOR FUNCTIONS OF THIS MODERN LATHE ARE CONTROLLED FROM THE OPERATOR'S POSITION AT THE CARRIAGE.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

- Wide speed range permits use of either high speed steel or carbide tools.
- Feed and traverse functions entirely independent of thread cutting mechanism.
- Feed rate and cutting speed, within the range of their respective motors, are adjustable independently without interrupting the cut.
- Lead screw for thread cutting only.
- All anti-friction bearing headstock.
- Hardened steel bedways.
- Main drive motor speeds and feed and traverse functions are conveniently controlled from the operator's position at the carriage.

- Altogether, this modern lathe embodies the advanced features necessary to meet today's demand by industry for high production with greater accuracy and durability. Full information on this lathe or other Betts-Bridgeford Heavy Duty Lathes from 26" to 144" and larger will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

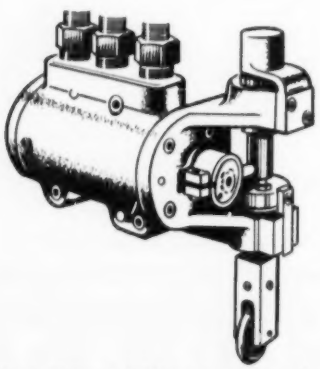
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

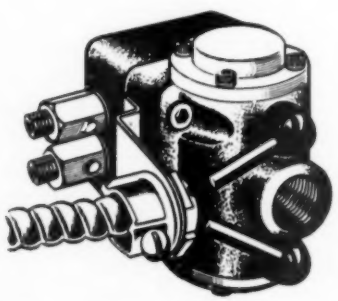
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

UNBRAKO SOCKET CAP SCREWS have knurled heads for sure grip and fast assembly; accurate hex sockets for positive, nonslip internal wrenching; fully formed threads, Class 3 fit. They are made of heat treated alloy steel, with controlled fillet and continuous grain flow, for strength; and are available in standard sizes from #4 to 1" in a full range of lengths.



USE UNBRAKO SOCKET CAP SCREWS for compact designs to save space, weight and material on machine tools and metalworking equipment.



On textile machines, automotive equipment, electrical and electronic devices, and production machinery.

Do you really need a special UNBRAKO?

Before you specify a special socket screw, check UNBRAKO Standards. A standard UNBRAKO will do the same job much cheaper in most cases. You'll get better service and faster deliveries, because UNBRAKO socket screw products are stocked by your industrial distributor. Write for UNBRAKO Standards. SPS, Jenkintown 1, Pa.

UNBRAKO® SOCKET SCREW DIVISION

SPS
JENKINTOWN PENNSYLVANIA

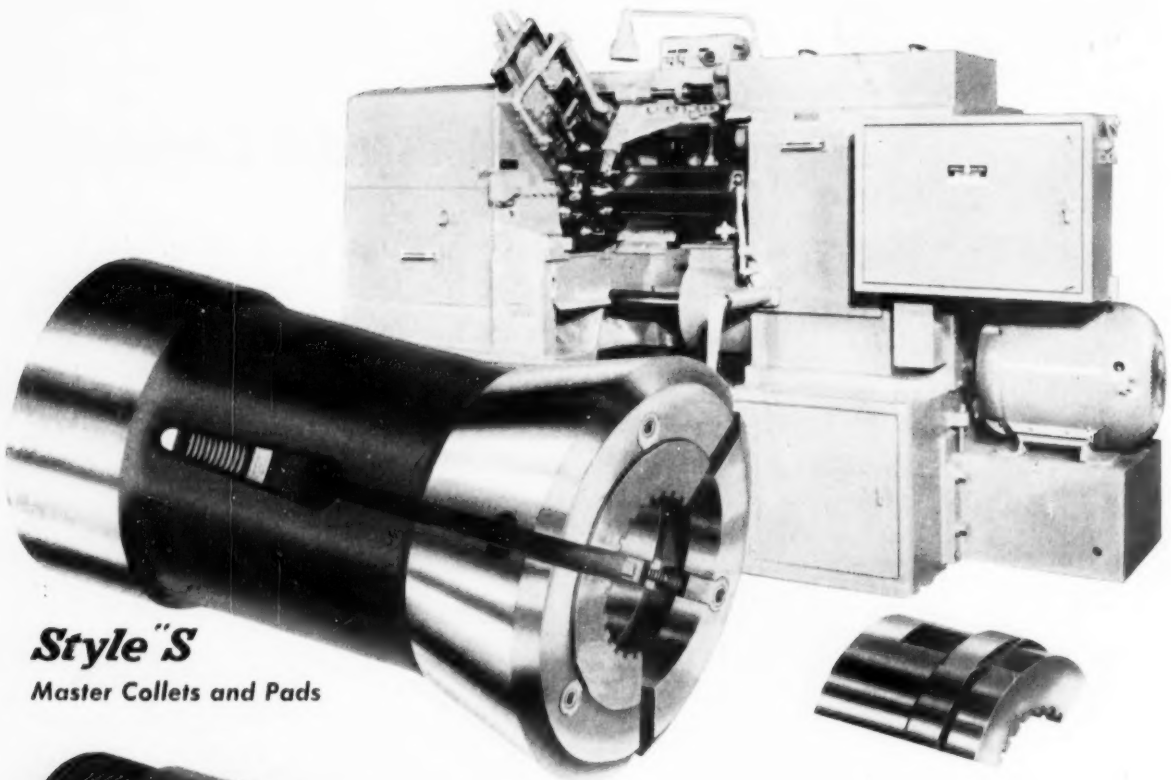
On precision instruments, dies, jigs and fixtures, and many other applications too numerous to mention.

UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

HARDINGE
ELMIRA, N.Y.

STANDARD EQUIPMENT
in Progressive Screw Machine Plants

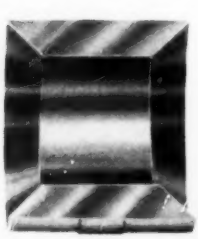
The Only Master With NO Work Pressure On The Screw

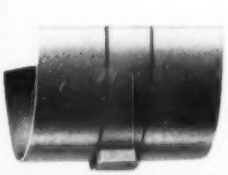


Style "S"
Master Collets and Pads

Pads Interchangeable Among Different Makes of Automatics

Style "B"
Master Feed Fingers and Pads





HARDINGE BROTHERS, INC., ELMIRA, N. Y.

No. 6 in a Series

Carbides dictate the conditions

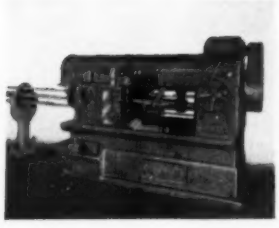
All accepted cutting tool materials have the common characteristic of specifying the conditions under which they will perform at maximum efficiency. And if the results are sufficiently promising the conditions will eventually be met.

ONE HUNDRED PERCENT carbide application on a multiple spindle bar automatic makes specific demands on both machine and personnel for successful use. The part illustrated is from regular production on comparative runs, in a plant where the conditions were met.

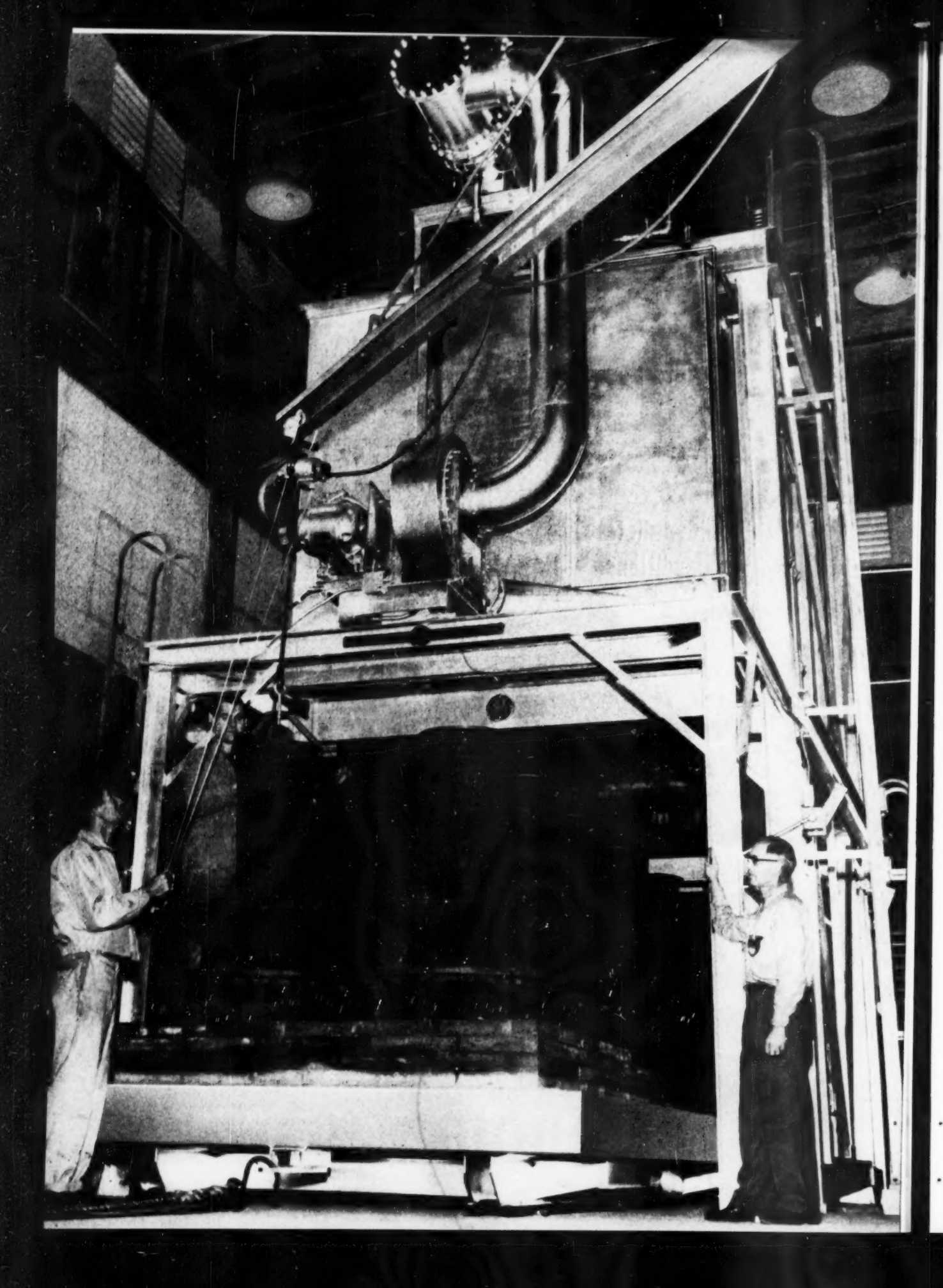
The Conomatic Carbide Development program can be of possible service to you in determining the suitability of your work, or any part of it, to 100% carbide tooling. Just ask your Cone Representative for details, or inquire direct.

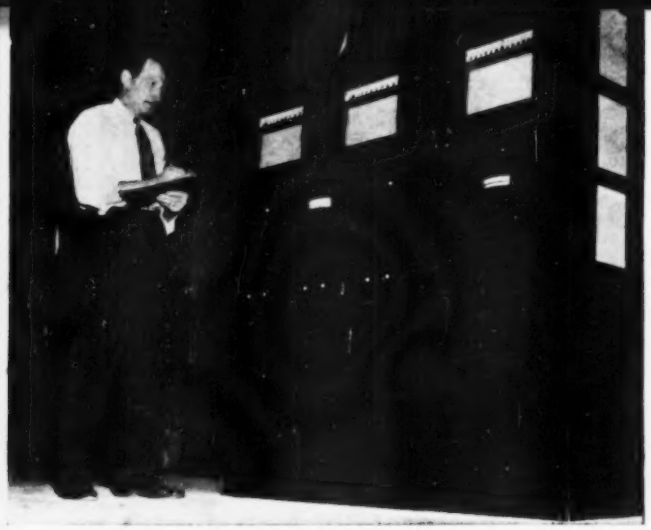
MATERIAL — BRASS: Pickoff attachment in 6th position permits machining piece complete.

	HSS	CARBIDE
Cycle Time	12 secs.	6 secs.
Work Spindle Speed	1125 R.P.M. at 331 S.F.	1528 R.P.M. at 450 S.F.
Tool Wear	50,000 pcs. per grind	unlimited number of pieces per grind

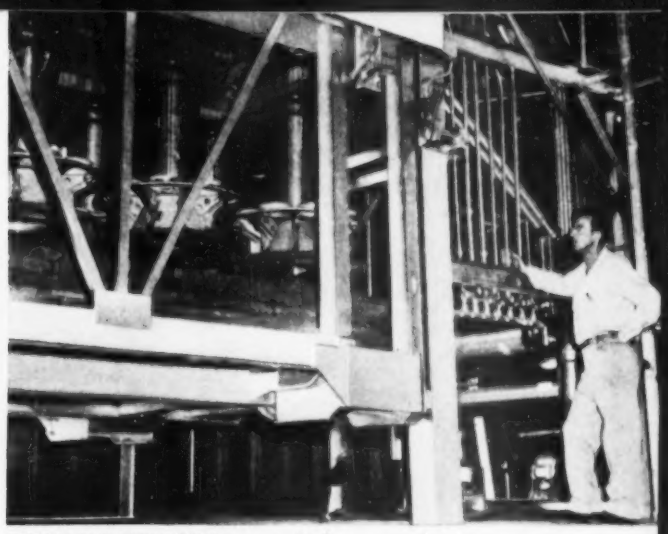


Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.





PROPER CONTROL AND TIMING of the complete heating cycle is provided by the G-E heating control unit above. To assure efficient furnace operation and uniform heating of parts, the unit provides automatic programming of heating and cooling cycles.



ONLY ONE OPERATOR is required to supervise temperatures, pressures, cooling phase, and atmospheric conditions. To minimize oxidation of jet parts a G-E gas converter, right, supplies gases of varying analyses as required by the heating cycle.

Solving Ryan's complex heating problem speeds nation's jet engine production

Key to success of America's jet engine program are the subcontractors who back up the large jet engine producers. One of these subcontractors is Ryan Aeronautical Co., San Diego, Cal. In setting up their jet aft frame production, Ryan had the problem of relieving residual stresses without distorting the metal.

After studying the problem with General Electric engineers, Ryan specified a furnace that would provide uniform heating and cooling at 200 F. per hour. Fast production at low cost was also necessary.

Applying years of experience gained in the development of America's first jet engine, G.E. designed and built a special elevator furnace that allows automatic program control of the complete time temperature cycle. This assures uniform heating of each part without weakening the metallurgical structure.

STRESS RELIEVING JET AFT FRAMES in this specially designed elevator furnace is accomplished with minimum distortion of metal. Constructed to assure low-cost, high-quality heat treatment the furnace is the result of years of G-E heating research.

Fast cooling is provided by a special blower system that extracts hot air from the furnace, cools it, and then blows it back into the heating chamber. Elimination of costly reducing operations is made possible by using a G-E atmosphere converter to minimize oxidation of the aft frames. As a result Ryan receives consistently high-quality heat treatment.

Heat losses and atmosphere consumption are reduced to a minimum by a specially designed loading car that rolls under the furnace and is hoisted by electric motors to form a completely heat-sealed furnace bottom.

RYAN GETS VALUABLE INSTALLATION SUPERVISION

To assure Ryan of proper furnace operation, G-E engineers supervised the complete installation in Ryan's plant. This is standard service from G.E.'s field staff of service engineers —unmatched both in size and experience by any other heating equipment manufacturer.

This example of G.E.'s heating service is a big reason why you should contact your nearest G-E Apparatus Sales Office when selecting your heating equipment. 720-114

You can put your confidence in—

GENERAL ELECTRIC

120 YEARS OF KNOW-HOW

from all over the world flows into your plant from PARKER

Parker Rust Proof Company, U. S. — **38** years

Metallgesellschaft, A. G., Germany — **26** years

The Pyrene Company, England — **28** years

Societe Continentale Parker, France — **28** years

120 years

Our customers, through our international affiliations, get the benefits of world-wide research, experiment and application.

For the best in surface treatments for metals, call on Parker!

**Bonderite, Bonderlube, Parco, Parco Lubrite — Reg. U.S. Pat. Off.*

Since 1915—leader in the field

PARKER RUST PROOF COMPANY

2196 E. Milwaukee Ave., Detroit 11, Michigan

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces

NEW! A PRACTICAL SHOP TOOL FOR MEASURING

SURFACE ROUGHNESS

THE BRUSH SURFINDICATOR*

WITH this instrument, you can *specify* surface roughness in average microinches on the blueprint—*measure* surface roughness quickly in the shop.

Developed by General Motors Research Laboratories Division. Manufactured under patent license from General Motors Corporation.

EASY-TO-USE • PORTABLE • ACCURATE

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT
ULTRASONIC EQUIPMENT

formerly
The Brush Development Co.
Brush Electronics Company is an operating unit of Clevite Corporation.

*Trade Mark

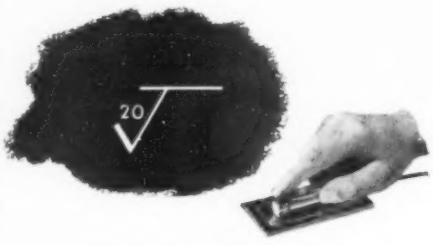
SURFINDICATOR

helps you meet surface finish specifications exactly

With this new, portable inspection tool, you can make surface roughness measurements on the production line. The operator merely guides the pickup over the piece to be inspected, and then reads surface roughness in average microinches on the meter. This permits you to specify surface roughness in the design and then to measure it in the shop.

The SURFINDICATOR is always reliable because the unit is equipped with precision reference specimens. These permit checking accuracy of the instrument at any time, and provide a set of standards for absolute calibration. Using SURFINDICATORS, several plants in different locations can produce parts to the same surface roughness specifications. Here is the instrument that makes surface roughness measurement a practical shop operation. Get the complete story on the BRUSH SURFINDICATOR now!

PORTABLE... Weighs only 15 pounds and can be set up anywhere in the plant where 60-cycle, 115 volts a.c. is available. Completely self-contained.



ACCURATE... Precision reference specimens permit calibration to an absolute standard and enable you to check accuracy of instrument at any time.

AVOID DELAY—*enter your order now!*

Thorough field testing of the SURFINDICATOR has now been completed. If you wish to reduce costly rejects and improve your surface finish control, we urge you to place your order quickly, either through your nearest Brush representative or with the coupon below.

Price of the SURFINDICATOR is only $685 f.o.b., Cleveland...far less than other types of surface measurement instruments. The SURFINDICATOR is a *shop tool*—requires no installation; shipped completely packaged; ready to put to work

Brush Electronics Company, Dept. U-9
3405 Perkins Avenue • Cleveland 14, Ohio

☐ Please enter our order herewith for ____ Model BL-110 SURFINDICATORS, at $685.00 each, f.o.b., Cleveland.

☐ Purchase order is attached.

☐ Please send additional information on the SURFINDICATOR.

Name .....

Company .....

Your position .....

Address .....

City ..... *State* .....

Specifications of

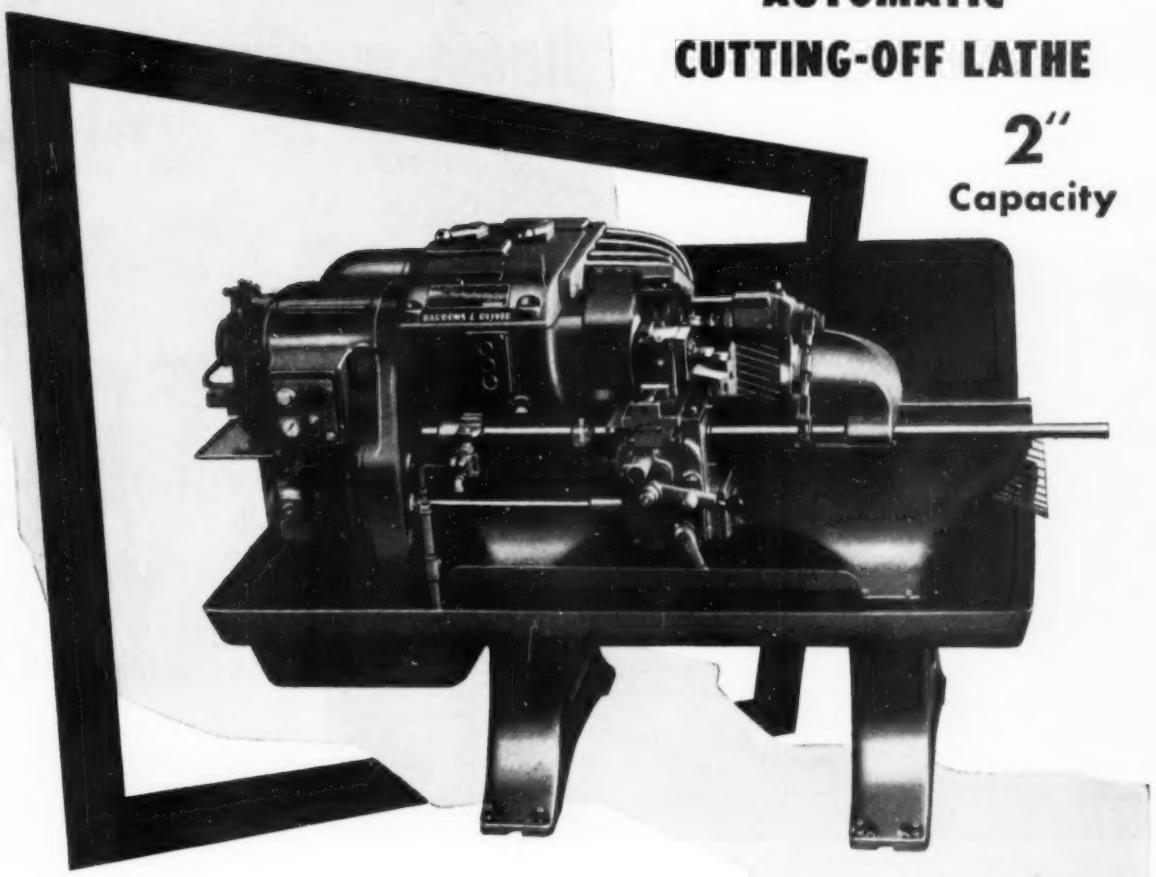
SURFINDICATOR

Roughness range	1 to 1,000 microinches
Range scales	0-10, 30, 100, 300 and 1,000 arithmetic average microinches
Cutoff wave lengths	.003, .010, .030-inch
Warmup time	3 minutes
Power required	115 volts, 60 cycles, a.c.
Dimensions	10¼" x 9" x 8¾"
Net weight	15 lbs.
Shipping weight	18 lbs.
Model	BL-110 Surfindicator

(Includes Amplifier, Pickup and Precision Reference Specimens)

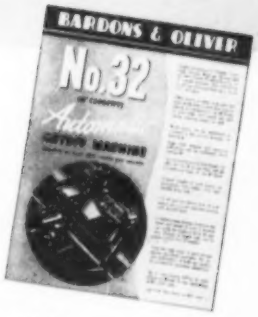
Improved...

BARDONS & OLIVER
MODEL NO. 32
AUTOMATIC
CUTTING-OFF LATHE
2" Capacity



Increased Rigidity and Sturdiness of the entire tool feeding mechanism results in more continuous production and assures a longer, accurate life of the machine.

The machine is capable of over 100 cycles per minute . . . its production *AVERAGE* is 30,000 pieces in an 8 hour day. Highly productive for nipples, couplings, ferrules, bushings, spacers, and all other tubular products.



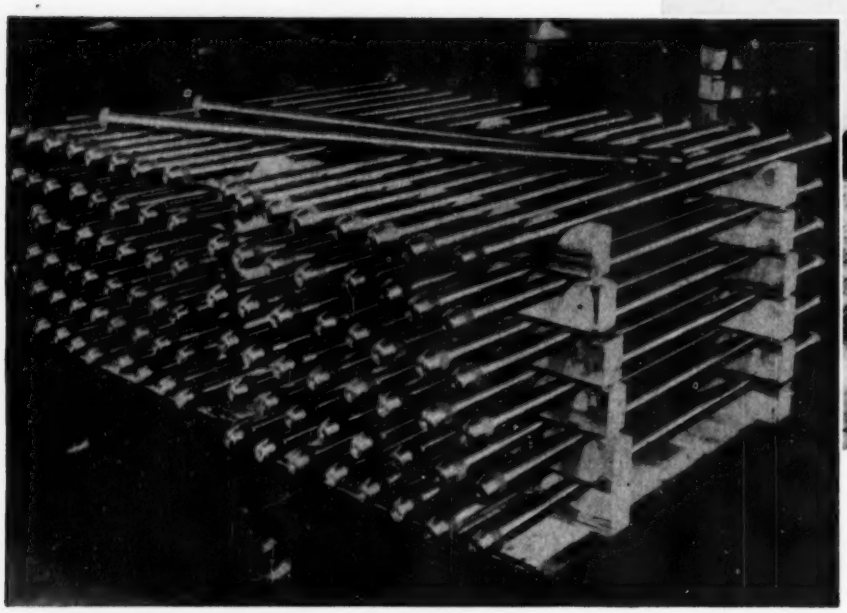
Write us on your company's letterhead for this new Catalog.

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

U·S·S Carilloy steel cushions

on the world's finest medium tank



HERE ARE THE Carilloy steel torsion bars ready for shipment. Torsion bars are used on the Patton 48 and others so that the tanks can be built closer to the ground, giving a lower silhouette.

ON THIS TWISTER ... the Cicero plant of Maremont Automotive Products, Inc., the finished Carilloy steel torsion bars are prestressed before shipment to the tank manufacturer.

bone-rattling jolts

THE army's amazing new Patton 48 not only moves faster, shoots straighter, and offers better protection to the tank crew, but it has a vastly improved suspension system that features torsion bar springs made of U·S·S CARILLOY steel. As a result, it rides lower and more level with less jarring than World War II models.

During rugged field tests, this 45-50 ton tank rolls along at more than 30 miles an hour, knocks down telephone poles and houses, rumbles over deep trenches and scales 3-foot walls. All the while, the CARILLOY steel torsion bars that support the driving wheels flex, twist, and vibrate. They smoothly absorb most of the jolts as the tank forges ahead.

Torsion bars withstand this heavy pounding . . . and do a better job of cushioning these shocks than previous spring systems. What's more they take less space, so the tank can be built closer to the ground, giving it a lower silhouette than other models.

U·S·S CARILLOY 8660 is a Ni-Cr-Mo electric furnace steel which possesses the required hardenability needed in these torsion bars. It will produce a minimum hardness of 55 Rockwell "C" at 9/16" from the quenched end in the standard End Quench hardenability test. It has exceptionally good surface and subsurface qualities.

Both the U. S. Army Ordnance Corps and the spring manufacturer, Maremont Automotive Products, Inc. are well satisfied with this excellent performance.

U·S·S CARILLOY steels are doing many tough jobs like this on both military and civilian products. So no matter what type of steel problem you have, we have probably met and licked one very much like it before. We can help you solve yours. Just get in touch with our nearest District Office, or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

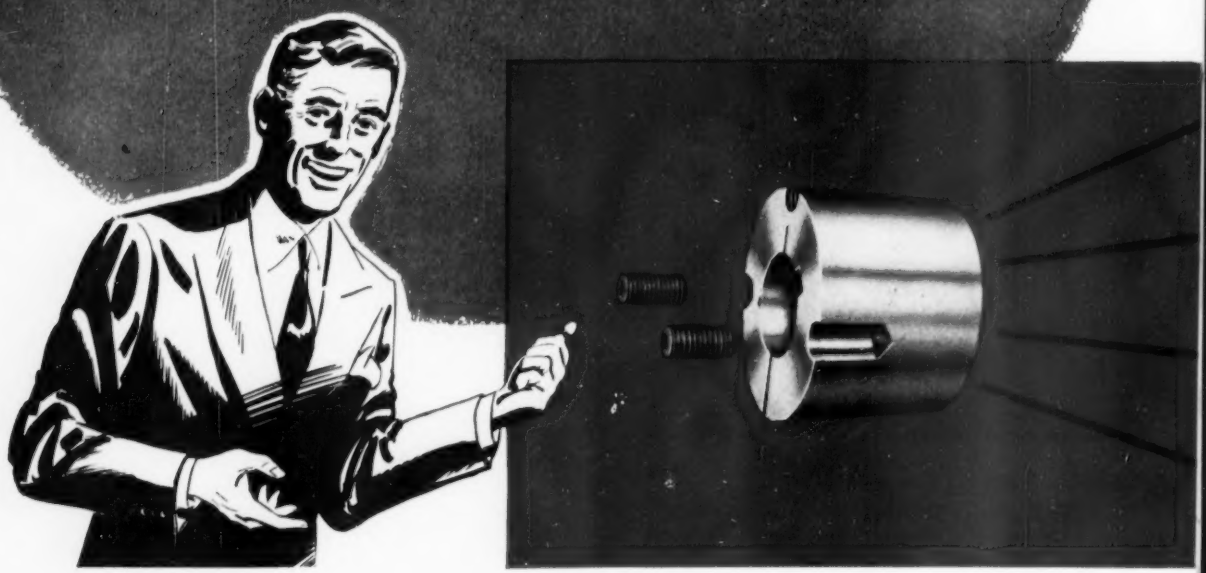
UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy USS Steels

ELECTRIC FURNACE OR OPEN HEARTH — COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

UNITED STATES STEEL

Now-Standardize on TAPER-LOCK



Now, for the first time, you can have all the benefits of standardizing on a truly modern method of mounting wheels on shafts . . . through the famous Dodge patented Taper-Lock design.

The time-saving, cost-cutting performance of Dodge Taper-Lock . . . already proved in millions of installations of Taper-Lock Sheaves, Couplings and Conveyor Pulleys . . . is now available in a complete line of Taper-Lock Sprockets with Dodge Roller Chain.

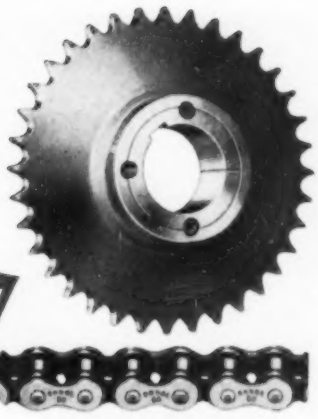
The bushing pictured here fits into the hub of every one of the Dodge products shown—sprockets, sheaves, couplings, conveyor pulleys. Both tapered bushings and hubs are precision machined to achieve perfect interchangeability. The result is less down-time on machines, simpler maintenance, reduced inventories. Taper-Lock gives you an unmatched opportunity to lower your costs and keep production rolling.

Dodge Taper-Lock grips the shaft for the full length of the bushing—holds with the firmness of a shrunk-on fit, yet comes off easily, quickly.

Taper-Lock's exclusive advantages were never more strikingly proved than in the new line of sprockets recently introduced by Dodge. For Taper-Lock brings to sprockets a new "off-the-shelf" availability. No time-consuming and costly reboring, key seating, drilling and tapping for set screws, needed to fit them to the shaft! Dodge Taper-Lock is available in both driver and driven sprockets from No. 40 to No. 100, up to 112 teeth. Taper-Lock bushings to fit shafts from ½" to 10" are available from stock.

Consider carefully the cost-saving advantages you get by standardizing on Taper-Lock — the modern method of mounting wheels on shafts. For further information, call your Dodge Distributor, or write the factory.

DODGE MANUFACTURING CORPORATION, 100 Union Street, Mishawaka, Indiana



TAPER-LOCK SPROCKETS and Dodge Quality Roller Chain

—THE MODERN WAY TO MOUNT SPROCKETS

—THE MODERN WAY TO MOUNT SHEAVES

TAPER-LOCK SHEAVES

—THE MODERN WAY TO MOUNT COUPLINGS

TAPER-LOCK COUPLINGS Rigid and Flexible

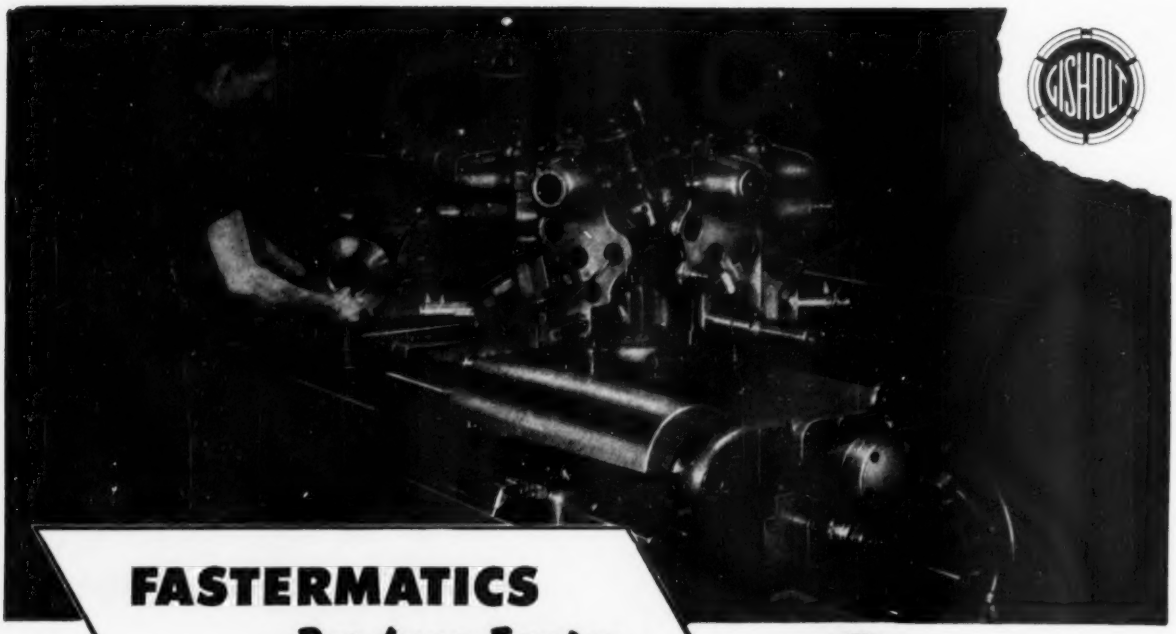
—THE MODERN WAY TO MOUNT CONVEYOR PULLEYS

TAPER-LOCK SOLID-STEEL CONVEYOR PULLEYS

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory-trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified phone book.

DODGE

of Mishawaka, Ind.



FASTERMATICS
Produce Faster— Pay Off Faster

It may seem incredible, in this day and age, for any major machine tool to "buy" itself in nine short weeks of operation. But that's exactly what the Fastermatic Automatic Turret Lathe did on this job of machining clutch plate hubs.

Former time, on hand-operated turret lathes, was 15 minutes per piece. The Fastermatic, with automatic control of all machine functions, reduced the time to only 3 minutes, floor to floor.

Earnings piled up so fast over former production costs that the Fastermatic paid for itself in just 9 weeks—or 893 hours of operation.

Do you have work that permits a number of cuts in one chucking? Investigate the Fastermatics. You may have a big opportunity to increase production, cut costs and save man power.

In this tooling setup, only 3 turret faces are needed to turn each part. With duplicate tooling on the remaining 3 faces of the hexagon turret, 2 parts are machined with each complete turret cycle. The operator merely loads and unloads the work.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

PACEMAKER 150-T OIL WAS USED
to replace previous oil that was causing deterioration of gaskets and packing of the injection molding machine shown here.

PACEMAKER 150-T OIL SAVES MANUFACTURER UP TO $600.00 PER MONTH

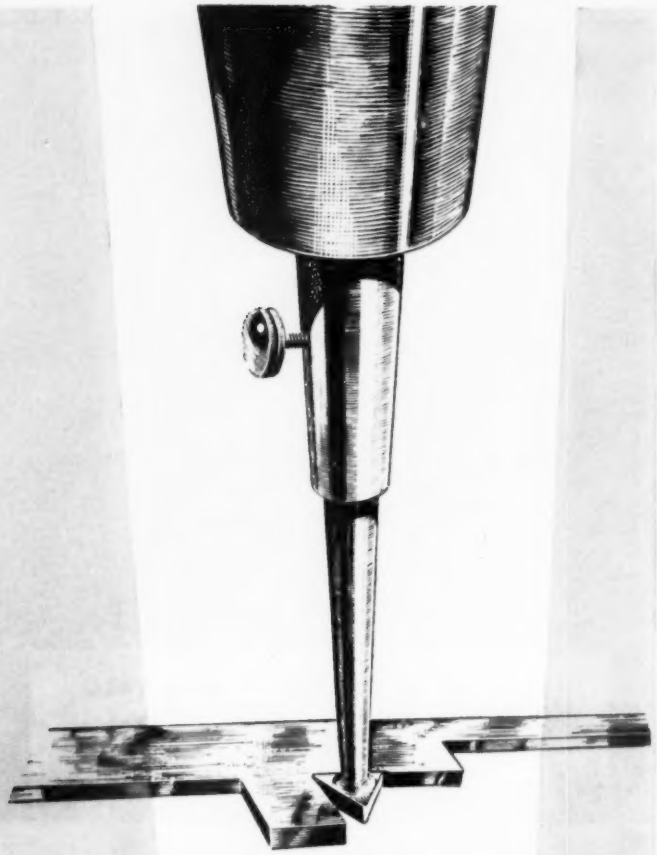
The injection molding machine (shown above) of Plasticks Inc. of Chicago was operating under 1000 p.s.i. at a water-controlled oil heat of 100° F to 120° F, 24 hours per day, 7 days a week.

THEN CAME TROUBLE! The hydraulic oil they were using was seriously damaging gaskets and packing. So, they called in their Cities Service Representative . . . and he recommended Cities Service Pacemaker 150-T Oil.

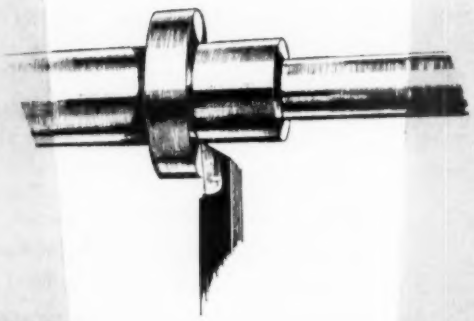
THE RESULTS WERE PHENOMENAL! With Pacemaker 150-T, the machine was able to run far longer on an oil change than ever before! Machine filters were cleaner with each change. Gumming and deterioration were eliminated! . . . AND DOWNTIME WAS CUT 20% to 25% AT THE AMAZING SAVINGS OF $450.00 to $600.00 PER MONTH!

You too can realize big dollar savings and increase production by relying on the full line of Cities Service Industrial Lubricants. Call your nearest Cities Service Representative, or write Cities Service Oil Company, Dept. Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS



precision meets production



When precision meets production . . . the result is profits! That conclusion has been proved again and again by Lodge & Shipley Lathes.

Each type of Lodge & Shipley Lathe has many special advantages, some of them exclusive developments. They all have a common purpose, more production, greater accuracy and lower cost. They all have set notable records in American and foreign industry.

Even if your present lathes were "the last word" only a few years ago, you should investigate Lodge & Shipley's contribution to "more production through modernization."

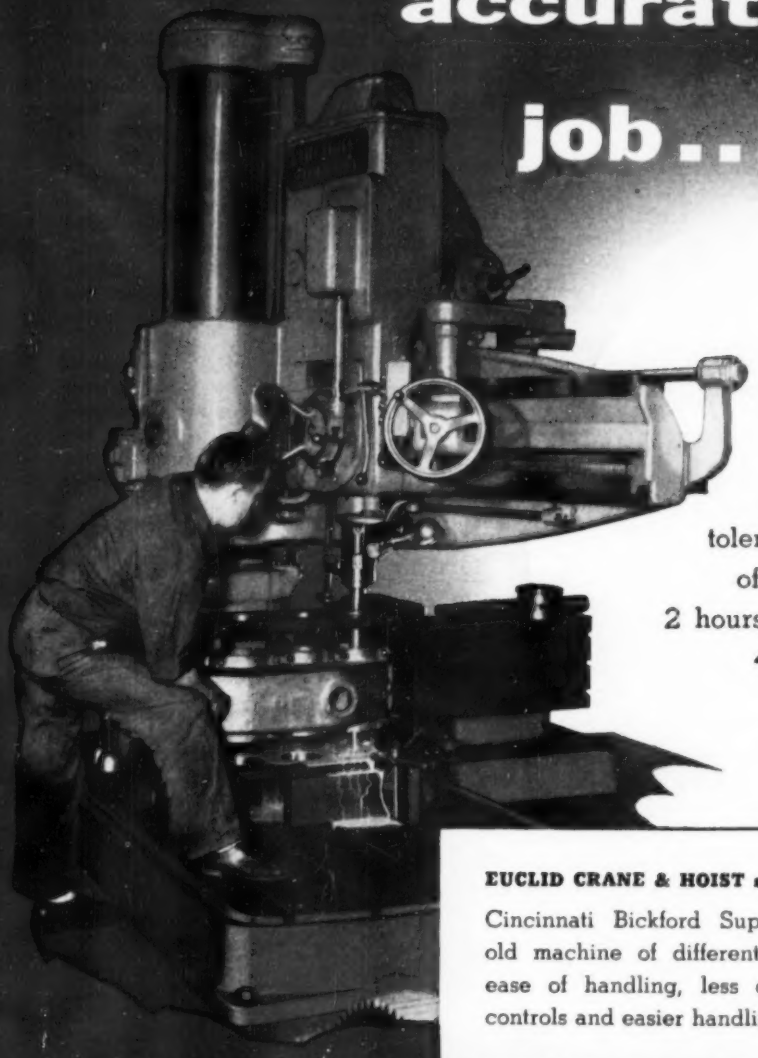
A Lodge & Shipley representative will gladly survey your work. He'll show you, with comprehensive case histories, how Lodge & Shipley Lathes are setting production records on comparable work.

THE **Lodge & Shipley** COMPANY

3059 COLERAIN AVE., CINCINNATI 25, OHIO.

doubling production...

on this big, accurate job...



Here is another example of the accuracy and productivity of Cincinnati Bickford Super Service Radial Drills. Holes of 4.750" and 6.250" diameters are bored and held to .001" tolerances in this steel casting. Time of operations was reduced from 2 hours and 30 minutes to 1 hour and 40 minutes—practically doubling speed of production.

Write for Booklet R-29.

EUCLID CRANE & HOIST says:

Cincinnati Bickford Super Service Radial "replaced an old machine of different make—machine brought greater ease of handling, less operation fatigue thru convenient controls and easier handling."

Photo courtesy of The Euclid Crane & Hoist Co., manufacturers of Overhead Traveling Cranes.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

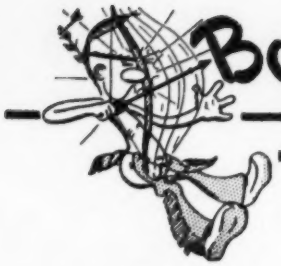
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.

L & I's broader range of high quality STANDARD reamers has met with overwhelming acceptance. Ask your distributor for latest information on L & I's quality plus . . .

L&I *The Reamer Specialists*

LAVALLEE & IDE, INC.
CHICOPEE, MASS.



Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Omission

In my article on the production of flanged parts made by splitting flat stock (*AM*—Feb 2, '53, p120) I wish to call your attention to the fact that the original manuscript stated that the idea originated with Messrs Schreder, of Belgium. This fact was omitted from the article, as published, and the impression may be given that I am taking credit for it as my own idea. The credit properly belongs to Messrs Schreder.

M Huisman
Breukelen, Holland

Our apologies for omitting Messrs Schreder's name; it was quite unintentional.—ED.

Tap Trouble

I have been handling tapping problems for a while with fine-thread taps about ½-in. dia, in tough stringy steel tubing, and have had some interesting experiences. For instance, tap manufacturers have sent in pilot lots of taps which gave moderate to very satisfactory performance; then when they sent in the remainder of the order or another shipment, the taps would not work at all or gave a very poor performance. This happened not once, but many times.

Some taps were spiral pointed with so much "hook" there was not enough metal to stand up in action; these failed in four or five cuts. Others were so nearly radial that they stalled the tapping machine. Some taps were so slightly chamfered they left a burr at the end of the tap; others were so rough they quickly gathered metal (welding or pickup), so they were useless.

The lubricant was an emulsion and so applied that a person could hold his fingers on the tube being tapped and feel only a slight warmth, although there is only about 0.030-in. thickness of metal between the thread line and the outside of the tube.

Tapping was tried at various speeds from about 600 to 1600 rpm and the best threads were produced at the latter speed. Maximum tap life has been 6500 pieces tapped about ½ in. deep, but the average has been far below that.

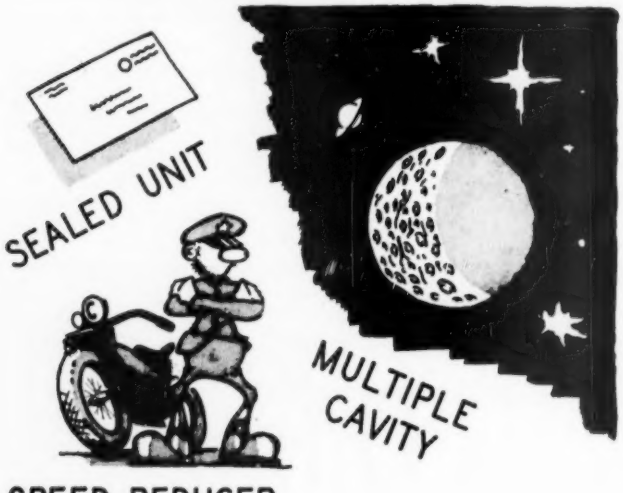
I formerly thought of tap manufacturing as a precision job, but now I am wondering, as I have been dealing with class 1 threads.

I would be glad to hear of the experience of others doing this kind of work.

Ira A Butcher
Cincinnati

GRINETICS

By D G SMITH



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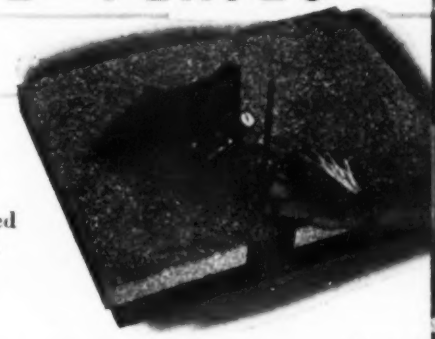
ANNOUNCING

BRYANT ROCK OF AGES GRANITE SURFACE PLATES



Now, for the first time, users of granite surface plates can get surface plates that are *doubly* guaranteed — guaranteed as to highest quality of stone and guaranteed as to utmost precision of surface.

Bryant Chucking Grinder Co., maker of precision machine tools and gaging equipment, joins with the world-famous Rock of Ages quarry in producing these new granite surface plates which offer unsurpassed advantages in layout, inspection and assembly work.

The plate material itself has its origin in the fabulous Rock of Ages quarry in Barre, Vermont, judged by many geologists to be the finest deposit of granite ever discovered.

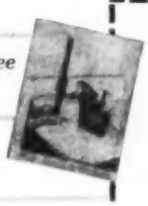
Rock of Ages granite is unique for its exceptionally close-knit composition and flawless texture. The stone is finished on the head of the grain, a patented process.

Bryant Granite Surface Plates are economical because of their low initial cost . . . maintenance-free qualities . . . long-lasting accuracy.

Bryant *unconditionally guarantees* the flatness and accuracy of all Bryant Granite Surface Plates.

BRYANT CHUCKING GRINDER CO., Springfield, Vermont, U. S. A.

Send coupon for free specification folder



Bryant Chucking Grinder Co. AM
Springfield, Vt.

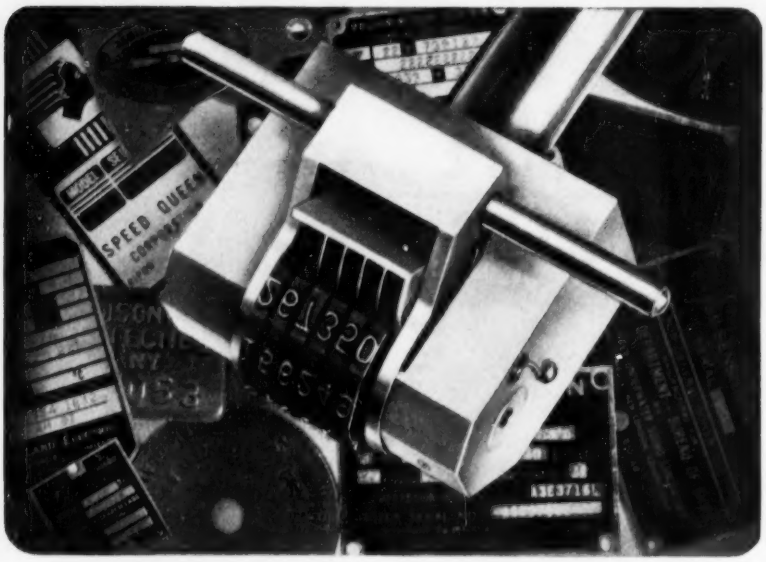
Gentlemen: Please send me your new free folder describing Bryant Granite Surface Plates

NAME_____ TITLE_____

COMPANY_____

STREET_____ CITY_____ ZONE_____ STATE_____

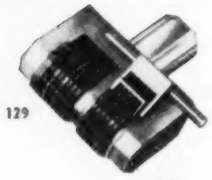
LEADERS IN INDUSTRY MARK WITH NOBLEWEST



Noblewest Numbering Heads

There's Nothing Finer For
PERMANENT NUMBERING

Whatever your numbering problem, a NOBLEWEST Numbering Head will do the job better. Automatic heads for serial numbering and non-automatic heads for selective numbering are available. Specially designed heads offer unlimited possibilities for *constant, selective* and *consecutive* numbering. For complete information write to Noble & Westbrook Manufacturing Co., 17 Westbrook Street, East Hartford 8, Connecticut.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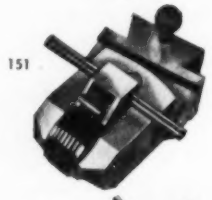
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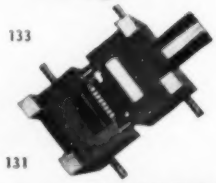
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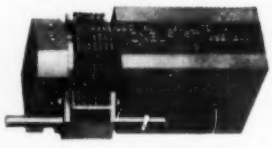

131

MODEL 129: Special head combines set of automatic wheels and set of non-automatic wheels. Head stamps a serial number group and a random number group.

MODEL 151: NOBLEWEST Rocker Style Numbering Head. Designed for roll marking on flat surfaces. Dovetail shank fits NOBLEWEST marking machines. Both automatic and non-automatic models available.

MODEL 133: NOBLEWEST Embossing Head. Male and female wheels form raised characters in metal. Debossing heads for depressed characters. Both automatic and non-automatic styles.

MODEL 131: Includes wheels for automatic *consecutive* numbering mounted in special frame with permanent one-piece marking die for *constant* marking. Die is mortised for interchangeable steel type for *selective* numbering.

MARK IT BEST WITH NOBLEWEST

NOBLEWEST IMPROVED MARKING DEVICES

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

More Practical

In reference to the Practical Idea (*AM*—May 11, '53, p174) entitled "Spring on Vise Handle Prevents Pinched Fingers," I have avoided this trouble by springing over the knobs at either end of the handle a rubber washer which fits snugly against the knobs. The rubber functions as a cushion between the two steel surfaces instead of one's fingers.

In the past, when glass bottles with screw cap and rubber washer were more common, I found these washers suited the purpose admirably. Now, if I cannot come by such a washer, I either make one or twist around several rubber bands.

As you will appreciate, no alteration to the vise is necessary, and some noise reduction is realized where many vises are used in close proximity.

N J Rippingham
London, England

Verstellbare Universal-Spanndorne
„System Bücha"
Bohrungs-Spannbereich
8–125 mm
Ludwig Wolfermann
Berlin-Friedenau
Varziner Straße 2

Old Stuff

As a reader of your excellent magazine, I want to inform you that the Practical Idea published recently (*AM*—May 25 '53, p151) under the heading of "Expanding Mandrel," actually concerns a commercial item, as you will see by the enclosed clipping from Machinenbau — Der Betrieb, March, 1939, p144.

Werner Wicke
Munich, Germany

The similarity is, indeed, remarkable, but we doubt whether our contributor actually copied it. It would appear to be a case of a good idea occurring to more than one person. Even more remarkable is Mr. Wicke's remembering the advertisement from 1939. — Ed.

Ladies First

I'm not a belligerent female but I do believe that we women have been overlooked by your very fine magazine. I realize that machining is (and probably will always be) primarily a man's field. But today, more and more women are taking their place in it and doing right well. I do not refer specifically to women as machine operators and assembly workers but to women who, besides

being busy housewives and mothers, are holding positions as time checkers, tool and product designers, and heads of quality control and time study, to say nothing of those who have reached top executive positions in Metalworking. It's about time that the powder-puff brigade in the metalworking industry was honored —if only by a sweep of your editorial hat.

Mary Streeter
New York City

Our hats are off to the ladies. If we have neglected to pay due homage to their abilities, we humbly beg pardon and promise to do better. — Ed.

Disaster Control

That was quite a fire they had at Livonia the other day—bad enough to have crippled half the automobile production in the country. But it looks to me as if General Motors should re-read that excellent booklet you put out some time ago on Disaster Control.

Here was a real disaster from non-enemy causes, but the damage couldn't have been worse if it had been from a bomb. It looks as if there was no disaster control officer, and evidently none of the workers had been instructed how to act in such an emergency. Otherwise, they wouldn't have run out and left their machines running, and somebody would have known enough to pull the main switches. It is hard to believe that the main feeder line was still "hot" the next day, but it cost two lives to find it out.

GM probably has a wonderful safety program covering such things as wearing goggles and not wearing neckties, but it is quite evident they were not prepared when a real disaster struck.

R S Billington
Milwaukee

Training Program

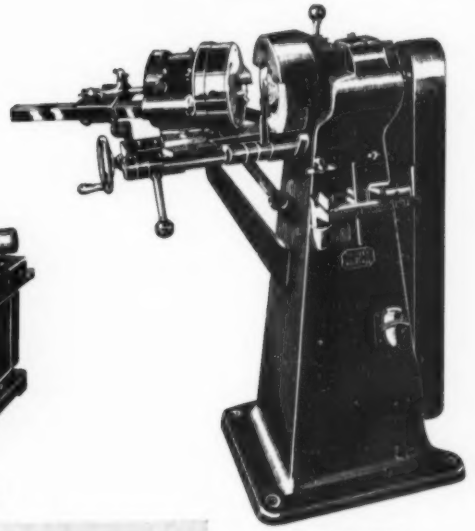
I am much interested in the setup for training Boeing draftsmen (*AM* — Aug 17, '53, p110). It is one of the best ideas I have seen in a long time for showing non-shopmen how machines operate without cluttering up the plant and interfering with production. I would like to know where to get similar working models.

H Graham
Boston

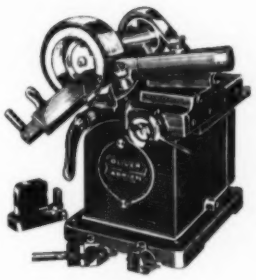
We understand that the working models were made by Boeing. We do not know of any company producing them for sale. — Ed.

OLIVER DRILL POINTERS

Pay for Themselves By Reducing Tool-Room Costs



MODEL #21



MODEL #510

Make this test—prove for yourself why the Oliver Way is the superior method for grinding drill points—making obsolete the old-fashioned, hand-grinding method. Send us a few drills which we will repoint and return to you at once. After comparing them with the drills in your crib ready to be issued, try them on your production work.

The results will convince you that the Oliver Way of machine grinding does it best . . . at the same time saving you money because Oliver Drill Pointers sharpen drills to cut faster, last longer, produce more accurate holes, and are more reliable. They assure balanced cuts because each lip does equal work, eliminating the excessive drill costs and imperfect holes usually traced to improper grinding.

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances Variable point angles. Full automatic operation.

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet "How To Produce More Holes With Your Drills!"

See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
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for prompt, dependable, quality service to match the quality and dependability of Starrett products.
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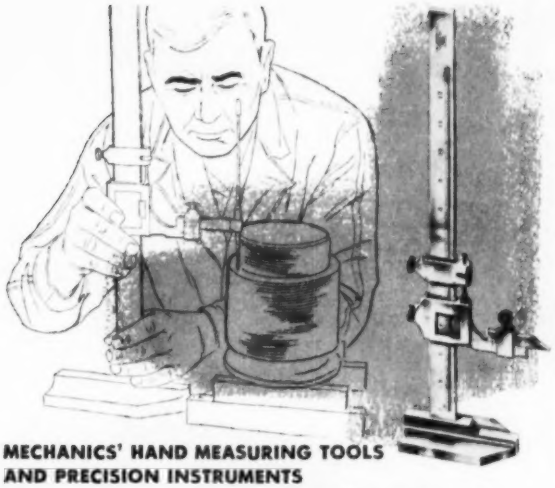
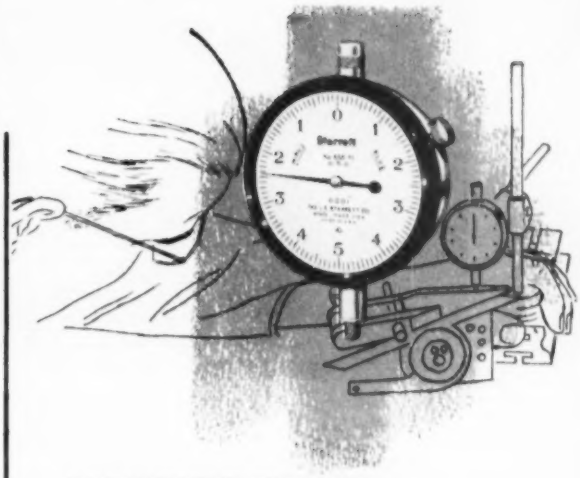
You'll find evidence on every hand right in your own shop of the trust and confidence placed in Starrett products. From layout bench to final inspection, from shop tool crib to the personal kits of skilled craftsmen in every department, Starrett tools and dial indicators are helping to maintain the highest standards of quality control. Make Starrett your buy word, too, when you order hacksaws, band saws and band knives or precision ground die stock and flat stock.
VISIT THE STARRETT EXHIBIT
BOOTH 2603
NATIONAL METAL CONGRESS
CLEVELAND, OCTOBER 19-23



MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS

When it comes to precision measuring tools — the tools that set your company's standard of accuracy — there is only one kind to buy and use . . . *the best!* To mechanics, machinists, inspectors, foremen and toolroom supervisors, "the best" always has and always will mean Starrett. There are over 3000 fine Starrett Tools to meet every precision measuring need.

PRECISION STEEL RULES AND STEEL TAPES



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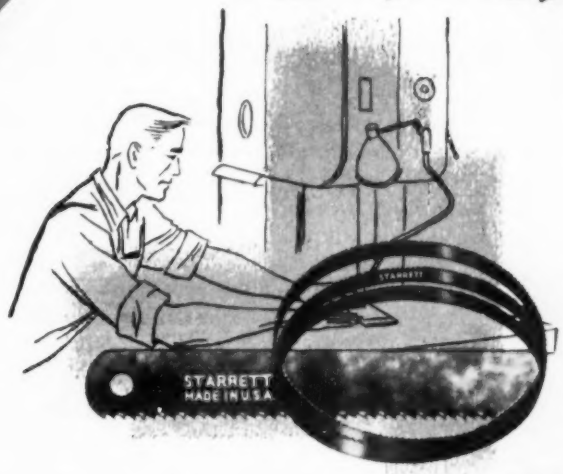
Durability, accuracy, efficiency — plus ready adaptability to the job in hand . . . that's what you get when you specify *Starrett* Dial Indicators and Dial Gages. Because they're precision made by the "World's Greatest Toolmakers," you can place complete confidence in their accuracy and dependability.

Starrett®



HACKSAWS, BAND SAWS AND BAND KNIVES

The same name, *Starrett*, means top performance, uniformity and maximum cutting economy in hacksaws, band saws and band knives. Blades and bands that bear the Starrett name must uphold the Starrett reputation. You can count on them to do the job better, last longer, cut quicker — give you more clean, accurate cuts at less cost.

INDUSTRIAL DISTRIBUTOR

PRECISION GROUND FLAT STOCK

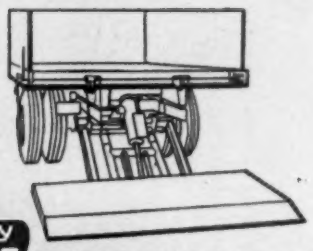
Die and flat stock made to Starrett specifications to eliminate distortion, cracking, rejects . . . precision ground to Starrett standards of accuracy to save time, save money making precision parts, pieces, punches and dies. Now made in four types, 295 sizes — air, oil, oil or water, and water hardening. Look for the mark of precision on every piece.

SINCE 1880 WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY

ATHOL, MASSACHUSETTS, U. S. A.

Checking the dies in a DANLY SPECIAL DIE SET—all steel, 4-post type, 26" x 35".



ANTHONY LIFT GATE HYDRAULIC

SHOWN IN LOADING POSITION

DANLY SPECIAL DIE SETS

View showing DANLY SPECIAL DIE SET during production run. Tail gate gussets are blanked and pierced in a single stage operation from 10 gage blue annealed sheet.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

help Anthony give industry a lift!

For years now, the Anthony Company, makers of hydraulic lift gates for motor trucks, has relied on Danly Special Die Sets in their production operation. Based on long experience, they've found that Danly Special Die Sets cut their tooling costs and save time . . . because they provide the finest precision starting point for diemaking. Why not build your production dies in Danly Special Die Sets? . . . see what die performance can really mean.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT—CALL YOUR NEAREST DANLY BRANCH

***CHICAGO** 50	2100 South Laramie Avenue
***CLEVELAND** 14	1550 East 33rd Street
***DAYTON** 7	3196 Delphos Avenue
***DETROIT** 16	1549 Temple Avenue
***GRAND RAPIDS**	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
***LONG ISLAND CITY** 1	47-28 37th Street
***LOS ANGELES** 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
***PHILADELPHIA** 40	511 W. Courtland Street
***ROCHESTER** 6	33 Rutter Street

*Indicates complete stock

SPOT NEWS of Metalworking

- **Britain will help sponsor a European Machine-Tool Show for the first time** next year. Representatives of the British machine-tool industry have joined the sponsoring committee of European nations and will participate in the Fourth European Machine-Tool Exhibition in Milan in Sept 1954.

- **Automotive industry demand for gear-finishing machinery is tremendous.** Apparently auto companies are today replacing even fairly new machines with new types that can save them money.

The Army is leasing 196 machines from its surplus supply at its Cleveland Cadillac Tank Plant to General Motors for temporary use at Willow Run in restoring Hydra-Matic production. Detroit machine-tool firms are said to have protested the move. But they have been assured by Ordnance that the loan is strictly an emergency measure, not at all precedent-setting.

- **Something new in exhibitor services:** the Third European Machine-Tool Show has shops where you can buy hardware, tools, office equipment and cleaning products without leaving the building. You can even get a suit pressed.

- **Automated plants cost plenty per worker** — about $28,750 each — for Ford's Cleveland enterprises (total investment divided by estimated workers). Capital-goods-per-worker in other plants averages $9200. But automated plants work twice as fast, use fewer people, amortize much faster.

- **Plastic production dies are being made in 80-86 hr with epoxy compound** developed at Boeing — compared with average of 250 hr needed to make similar dies from steel. Compound bonds to metal, wood, glass, glass fiber, etc, without pressure or heat treatment; can quickly be shaped by filing; hardens in 8 hr; reaches full strength in 48 hr or less.

- **Ford and GM may have to close their Brazilian assembly operations** because they can't get import licenses for dismounted automobiles to be assembled in Sao Paulo. But local interests are pressuring the government to help the US firms. Reasons: 30% of material used is local. Thousands would be unemployed.

- **New titanium brazing alloy is claimed to work better than silver.** It is made of nickel and titanium, plus copper, cobalt and molybdenum. Alloy is preplaced at joints for furnace brazing. Alloy is now available in powder form, may soon be prepared as wire for automatic inert gas welding.

Competition-wise, the auto industry is today tougher than ever. Despite the recent G-M Hydra-Matic plant fire and the need to get H-M production restored soon as possible, Ford, Chrysler and even GM's own Buick are riding machinery suppliers to get deliveries of new machines on order. The GM fire, they say, is no reason why they should have to take a back seat on priorities.

- **ODM is about to launch its accelerated tax amortization program,** expected to give defense expansion a big shot in the arm. Among other things, ODM will (1) wipe out over half its expansion goals, (2) tighten down on fast tax writeoff certificates, and (3) halt renewals of unused certificates.

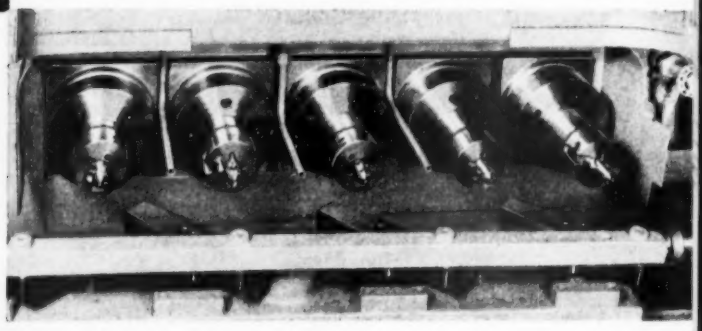
- **Canada has lost at least one new plant because of high-import duties** on raw materials. One firm planned to start in Canada, found import levies on raw materials were higher than on finished products, moved to the US.

80 SURFACES IN 1 CYCLE

EX-CELL-O

MACHINE BORES, COUNTERBORES, FACES AND CHAMFERS 20 HOLES

This Ex-Cell-O Precision Boring Machine performs operations on 80 surfaces in one cycle on the projecting holes of a cotton picker bar assembly. Five spindles on the machine bridge are positioned to engage every fourth hole. The fixture indexes automatically between machining strokes to align the next set of holes with the boring bars.



The machine is a standard Style 112-C having a heavy well-ribbed base and table, long stroke; handles medium-sized and large work.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

Ex-Cell-O's line of standard Precision Boring Machines is exceptionally complete. Ask your local Ex-Cell-O representative about them, or write to Ex-Cell-O in Detroit for Catalog 31205.

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

53-37

Washington

New rules under Taft-Hartley will come out of the National Labor Relations Board once the three Eisenhower appointees take over. They will change the general pattern of pro-labor decisions developed by the Truman board.

One rule already has been changed: A union cannot force you to impose a penalty less than dismissal (like loss of vacation pay or seniority) against an employee who refuses to join the union under a union shop contract.

Others indicated in dissenting opinion of Chairman Guy Farmer which may become the majority view later: giving less weight to card checks as indicator of union's majority status, leaving jurisdiction to state boards over employers having remote connection with interstate commerce, and cracking down on sound trucks near polling places.

Other policy changes likely: more free speech leeway for employers in bargaining election drives. Tightening of secondary boycott ban, curbs against strikes and new bargaining not permitted by contract.

NLRB next month will take another look at bargaining rights of craft unions in plants where bargaining usually is plantwide. But this is a hot issue between AFL and CIO. So NLRB may leave existing rules as they are.

• • •

Washington is "getting bored" with mobilization. The truce in Korea has heightened the feeling. Latest manifestations at ODM: tightening up on fast tax writeoffs and shelving of the mobilization base study, which might have been the key to more expansion. Even more important in the scheme of things is the fact that ODM is being shoved into the background by the new Pentagon team. There are some who feel that it'll turn out to be another NSBR—pushing papers around but doing nothing very positive.

• • •

Economic trends are giving Washington a new round of doubts on the business outlook. Behind it all is fear of a recession, and the administration's determination to do what it can to head one off.

The Eisenhower team is all optimism. For every downturn, they cite a compensating upswing. For every dark spot, they find a bright one. The notes of caution come from the old-line "professionals"—the technical experts who have been in Washington for years as career economists, administrators and such.

• • •

On the dark side are such factors as these: (1) construction figures are declining; (2) plant and equipment spending has been high for years, and the figuring is that it's due to drop about now; (3) housing starts have been down for three months in a row; (4) government construction and hard-goods buying are still under the lid, and chances are for more cuts as long as the budget stays in the red, which may be another 18 months.

• • •

On the other side of the coin are all the bright factors keeping the boom high. Consumer spending is still going strong. It's been the foundation of the postwar boom, and many experts expected the end of the Korean fighting to mark a turning point. But nothing has happened.

Furthermore, stimulants to business are coming. Business will get a tax cut January 1, when Excess Profits Tax finally dies. Consumers get a tax then too—a 2-11% reduction.

• • •

The Joint Chiefs of Staff review of military programs is due October 15. Defense Secretary Wilson is holding up budget estimates for next year until the nation's top military men have gone over the program and make recommendations for filling out areas of weakness.

Insiders believe Chairman Radford and the new team will approve Wilson's programs up to now. But JCS is against any further cutting, especially the additional $6-billion reduction that Budget Director Dodge would like to see taken out of the military's spending program for fiscal 1955.

In fact, it's likely they will recommend some increases in neglected areas, notably: guided missiles, anti-submarine activity, providing reserve forces with first line equipment, and continental defense against attack.

• • •

Korea veterans may be liable for further military service. The Universal Military Training and Service Act, along with the Armed Forces Reserve Act, imposes an eight-year military obligation on men initially entering the service after June 1951 if they are under age 26 at the time of enlistment or induction. Part of that time will be spent in the active or ready reserve—the rest in the inactive.

This is the current law and it makes no difference if a man signs any reserve enlistment papers or not, he's supposedly in the reserves anyway. The only trouble is that Congress failed to put any teeth into the act. It didn't provide penalties in case a man refused to attend ready reserve drill periods. The military could prosecute under other laws but first it will have to provide sufficient reserve facilities before it can enforce the law.

BETTER THREADS *Faster* and for *Less Money*

with a . . . .. MURCHEY "L" TAP

If your tapping operations include artillery shells or similar work where holes range from 1⅛" to 6¾", the Murchey Type "L" Taps are a natural.

POSITIVE RETRACTION: Chasers are pulled clear of the cut to collapse the tool at the end of the tapping cycle.

BETTER THREADS: The solidly anchored chasers cut full depth and with perfect uniformity.

ACCURATE PITCH DIAMETER: Diameter is accurately adjusted or changed in a matter of seconds without removing the tool from the machine.

NO CHIP TROUBLE: Pitch diameter adjustment and chaser assembly are sealed against the entrance of dirt and chips.

MAINTENANCE NEGLIGIBLE: The oversize plunger spring normally lasts for the full life of the tap. The positive sealing at both ends excluding chips and dirt protects internal members against abrasion.

For details on this and other Murchey threading tools contact your Murchey representative or write to us directly.

Lower Cost per Thread

MURCHEY DIVISION OF THE MURCHEY SHEFFIELD CORPORATION DAYTON 1, OHIO, U.S.A.

6115

Detroit

The heat of the fire at GM's Detroit Transmission Div was figuratively passed along to machine tool makers and other GM divisions almost before the ruins at Livonia had cooled off.

Many machines were loaded aboard trucks as quickly as they were pulled from the wreckage and shipped directly to original manufacturers.

About 30 of the machines were turned over to one company three days after the fire. With the machines went instructions to tear them down and repair or replace them within six weeks. Startled cries of "We can't do it!" soon turned to "We'll try!" under the stiff pressure exerted by GM.

The No. 1 auto maker applied the heat all along the line. It leased 1.5-million sq ft at Kaiser's nearly idle Willow Run plant in what must be record time for such transaction. The Air Force began at once to transfer its machines (previously used in C-119 production) out of the leased area.

But Air Force policy prohibits payment of overtime premiums. Thus, when a GM executive visited Willow Run on a Saturday and saw nothing moving, he called in outside contractors at once. When CIO Auto Workers members at the plant saw the job fading away before their eyes, they threw up a picket line.

The **blockade lasted only a day,** but moving-in operations were stopped for another day because space couldn't be cleared fast enough to make room for incoming machines.

In the meantime, the Army announced it would lease 196 surplus general purpose machine tools at the Cleveland Cadillac tank plant to GM for production of Hydra-Matics.

Protests by machine tool producers were answered by the Army with assurances that the leasing was a temporary measure only. The machines will be recalled as soon as GM can supply its own.

Original GM estimates that 6,000 machines were in the burned plant were revised downward. The transmission division had 3315 machines in use, while the Ternstedt area held another 1300 or so. Of the 3315 machines used in Hydra-Matic production, 560 were found to be completely unsalvageable.

• • •

Lincoln is now tooling up to produce its own automatic transmissions for introduction on its 1955 models. If Lincoln management cursed the timing of that schedule, it could be excused. The Livonia fire hit Lincoln harder than any other maker. It used Hydra-Matic in all its cars.

Lincoln's transmission stockpile ran dry the first week in September. But Lincoln has been testing an adaptation of Merc-O-Matic and may get back into production by October, using its version of Merc-O-Matic.

• • •

The "A" blast furnace of Great Lakes Steel Corp at Zug Island will be rebuilt starting next spring, to provide capacity of approximately 500,000 tons a year. With this larger quantity of raw materials required by Great Lakes and other National Steel Co units, National Steel will be capable of supplying about 6-million tons of cold rolled, or 40% of the auto industry's requirements.

• • •

"The Mecca of Research" — more prosaically known as the General Motors Technical Center — is spreading fast across GM's 813-acre site north of Detroit. Four staff organizations already have occupied 320 acres.

This part of the project alone represents an investment of more than $100 million. Construction on the Chevrolet and Fisher Body components is going ahead rapidly. Fisher will occupy 192 acres with three buildings large enough to house about 5,000 employees. Chevrolet's section will be composed of an experimental lab, an administration building and engineering shops.

No date has been set for completion of the giant project. Plans were first announced eight years ago.

• • •

About one out of every five Plymouths now leaving assembly lines is equipped with Hy-Drive, a recently introduced no-shift drive combining a torque converter and three-speed transmission. The optional unit delivers at the factory for $135 plus tax. Application of the new unit to cars involved 20 modifications in the engine, chassis and body.

• • •

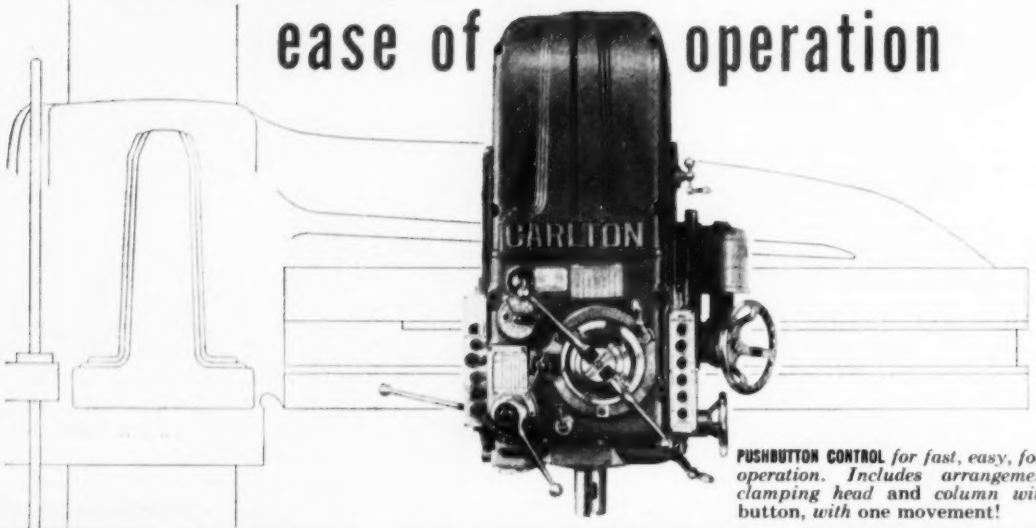
Ford Division has set up three new product groups at the Highland Park plant, where manufacturing is being decentralized. The rocket and parts machining plant, the trim plant, and the paint and artificial leather plant will each have their own staffs. Probably two and maybe three more similar product groups will be created shortly at Highland Park.

• • •

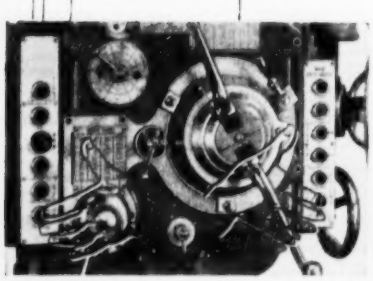
Ford's Ordnance Vehicle Project officials recently trotted out some prototype vehicles to show off to Army Ordnance Corps officers. Only the company and the military got a look at the results of a year of development and production work at Ford, but the prototypes are believed to be quarter-ton vehicles, designed to do a jeep's work.

Only ONE can be called the Finest: Carlton

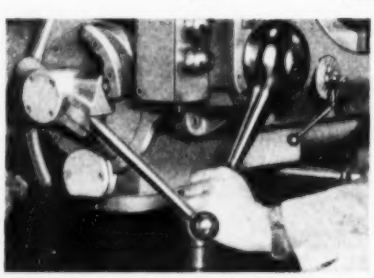
...here's another good reason why: ease of operation



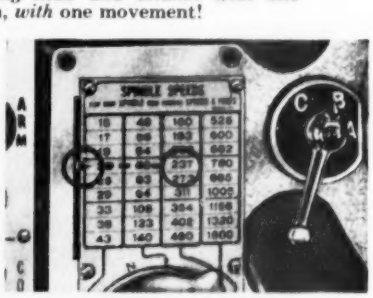
PUSHBUTTON CONTROL *for fast, easy, foolproof operation. Includes arrangement for clamping head* and *column with* one button, *with* one movement!



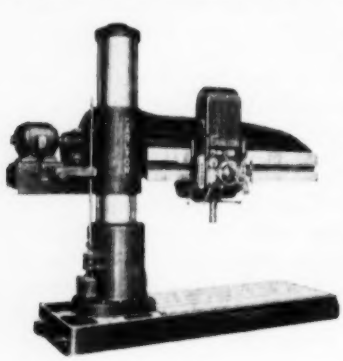
2-HAND CONTROL . . . *everything located within the arcs of a man's two hands. No groping. No fumbling. No lost motion . . . every move counts. Saves time and energy.*



2 LEVERS . . . *not three, but 2 levers control 36 spindle speeds. Simplified 2-lever control shortens machining cycle. More speeds mean wider range, more selectivity.*



SHIFT FROM DIRECT READING SPEED PLATE. *All 36 spindle speeds located instantly. No complicated 3-lever position charts to decipher. Spindle speed setting shown: 237 rpm.*



No other radial drill has pushbutton control . . . it's a Carlton exclusive.

No other radial drill can offer such easy, speedy operation.

No other radial drill can offer this combination of design, construction and operating advantages: pushbutton control, low hung drive, modern lubrication, 3-unit power clamping. There are many others, too numerous to mention here. Why not write us today for "the hole story." The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Machine Tools

Builders of presses are doing all right. Their sales this year have been substantial. Business booked in recent weeks has been of sizable volume too.

This generally satisfactory situation can be traced to the heavy orders placed by the automotive industry. Detroit has flooded some builders with work that will keep them fully occupied for months ahead.

• • •

Ford, for one, is in the midst of a gigantic expansion program embracing a brand new large stamping plant to be erected at Cleveland.

This plant will not be as big as the one at Buffalo that took a year or two to build. But it may wind up about three-fourths its size.

Many press orders already are on builders' books for this new plant. Not all the presses have been ordered, however.

• • •

Ford isn't the only automotive buyer in the market for presses. General Motors is purchasing presses extensively, too.

Automotive buying is not only for expansion. Much of it, in fact, is for replacement of old presses with new ones that will yield higher production and lower costs.

• • •

This spell of good business for press builders is much like the one that followed World War II.

The current demand goes far beyond automotive circles, but Detroit is the chief source.

A total of $3.4 billion was spent for machine tools and other production equipment by the armed services during the three fiscal years 1951 to 1953 inclusive.

The procurement was spread rather evenly among the three service branches. The Air Force led, with an outlay of $1.2 billion. The Army and Navy each obligated themselves for more than $1.1 billion.

During the three fiscal years the amount appropriated for machine tools and other production equipment came to $4.1 billion.

These figures, for actual commitments and for appropriations as of last April 30, show that some $767,000 remained uncommitted.

Since then the funds not yet spent are reported to have been reduced to $600,000.

It is hard to get a breakdown just for metal-cutting machine tools.

• • •

Outside of the Air Force itself, the largest single chunk of government money went for the Navy's "construction of aircraft and related procurement." It added up to $865,507,000.

The Army, to be sure, had a still bigger item. But it was on the vague side. More than $941 million was spent on equipment for "expediting production," whatever that means.

Navy Ordnance spent $205 million for present installations and facilities.

• • •

The machine tool industry responded instantly to the emergency arising from the GM fire.

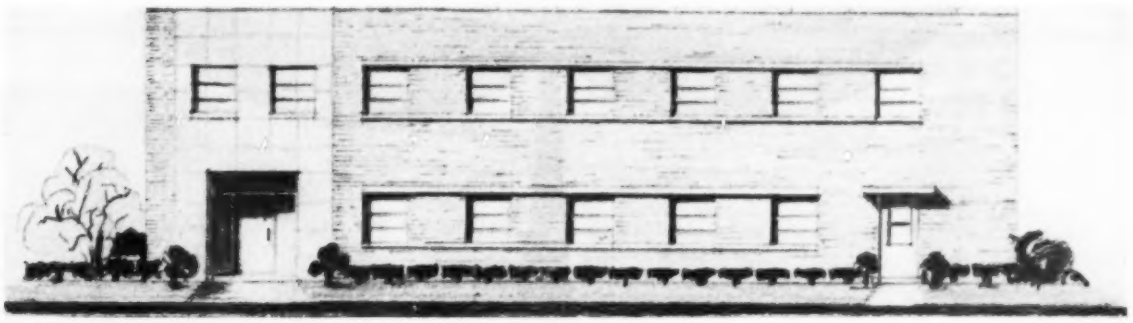
First GM-fire-burned machine tool to be rebuilt was completed in less than a week by GM's Willow Springs, Ill., Fisher Body plant.

One New England builder hastily rented two buildings and hired extra workers to recondition machines shipped by GM back to the factory. This builder normally does no rebuilding.

A midwestern builder, with the aid of a major subcontractor, put into production about 150-200 machines for General Motors without waiting for a formal order.

A prominent rebuilder of machine tools is swamped with GM work, carloads of machines having been shipped for overhauling and rebuilding.

BF

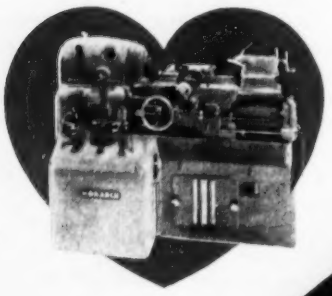


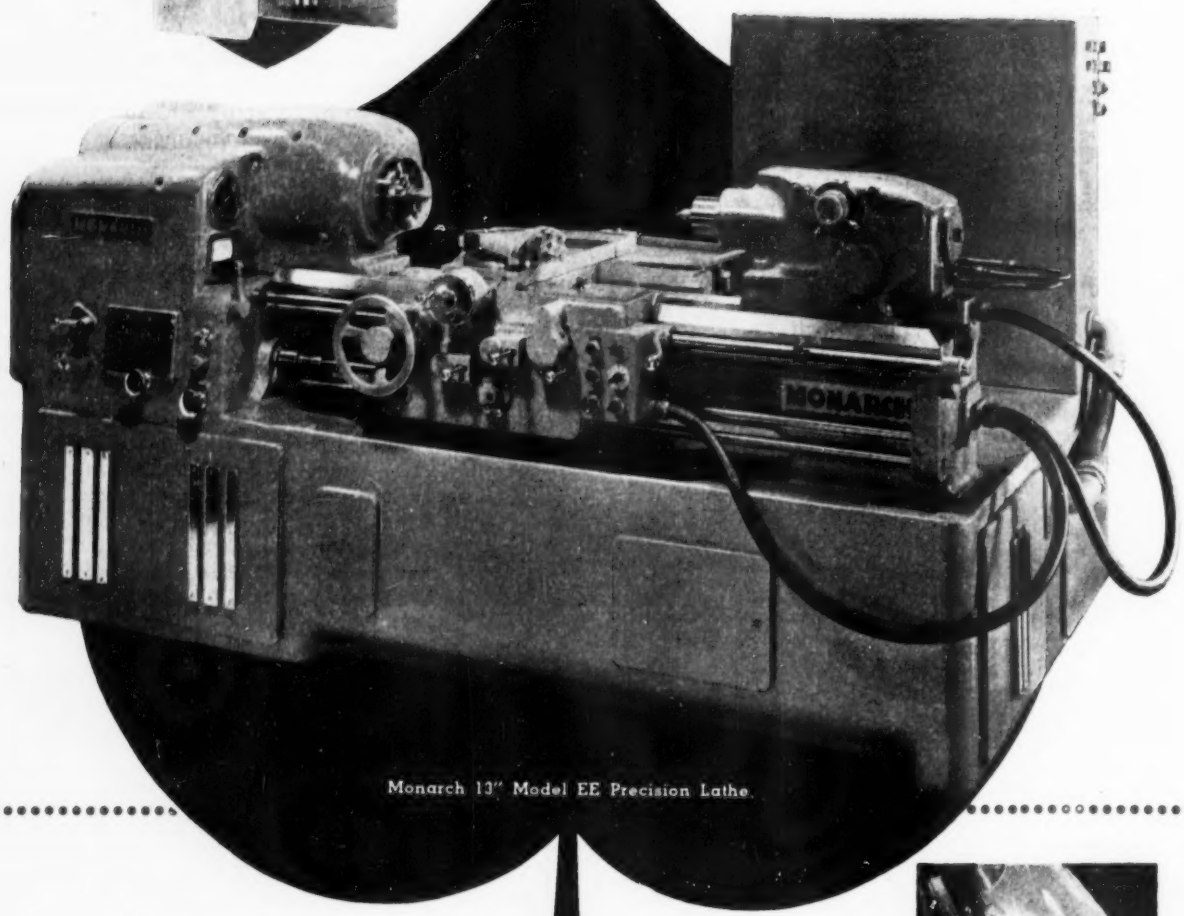
NMTBA'S NEW HOME WILL LOOK LIKE THIS. Construction of the two-story fireproof yellow-brick-and-stone building will be started soon. Located on East 102nd St, between Euclid and Carnegie Aves, Cleveland, the building will house the Statistical Dept, mailing room and print shop on the first floor; executive offices, Board room, accounting and stenographic departments and library on the second floor. It will be leased to NMTBA on a long-term basis

This One New

You're acquainted with this sweetheart—the 10" Monarch Model EE—one of the most popular lathes ever built. Over 6,000 in use.

Now—Monarch introduces the EE's big brother—the larger lathe you have been asking for. Not simply a larger EE, this new lathe embodies features never before perfected and combined in any lathe.





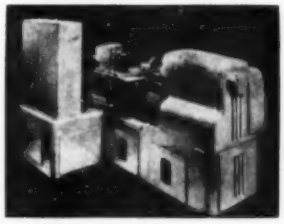
Monarch 13" Model EE Precision Lathe.

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

The mere touch of this button unclamps the 385 pound tailstock —a slight push or pull moves it along the bed while release of the button reclamps it. Its 3¼" diameter spindle is indicative of the strength built into the entire machine.

Ace Takes EVERY Trick!

Toolmaker's Lathe! Manufacturing Lathe! The New MONARCH 13" MODEL EE PRECISION LATHE is a Standout in Both Roles



Here's the first and only truly dual purpose lathe ever made!

In the toolroom, it provides toolmaker's precision—plus a new high standard in amount of work output. On manufacturing operations, it slashes turning time unbelievably, with no sacrifice of its basic accuracy. For more profitable performance in *each* use, and unequalled performance in *both,* the Monarch 13" Model EE is your answer for practically every type of turning.

Everything about this machine represents fresh engineering thinking. Consider these features.

1. Built-in constant surface cutting speed. Becomes operative at the flick of a switch. With it, the operator is *always* using the most efficient cutting speed. Finish and accuracy are improved; turning time on some facing operations can be reduced up to 50%.

2. All-hydraulic tailstock. Nothing like it on any other lathe. Hydraulic positioning and clamping permits almost effortless repositioning of this 385 lb. unit in a matter of a few seconds. Hydraulic feed and traverse to the spindle. Drilling and reaming operations performed with a quickness and ease never thought possible heretofore.

3. Infinitely variable speeds up to 2000 R.P.M. In four overlapping ranges and provided by a 15 H.P. variable speed motor. The number of speeds is limitless—the one which is ideal for the job at hand can always be secured. High speed range direct to spindle through multiple "V" belts for the ultimate in high finish performance.

4. Electrical speed change. It's practically instantaneous. The turn of a knob gives every speed within a given range; change-over from one speed range to another is automatic immediately upon resetting of selector knob. No calculating of lever settings by reference to an index plate. Nothing could be as simple, as quick, as positive.

5. Four-way rapid tool traverse. Cross traverse in and out and longitudinal traverse right or left provided by individual motor drive. Tool repositioning couldn't be made easier or faster.

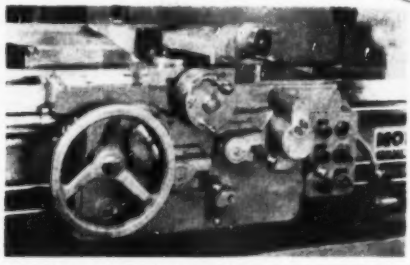
6. Flexibility unlimited. It's difficult to find a lathe job which the 13" Model EE cannot handle. There are 66 thread and feed changes. Regular equipment includes a ball bearing taper attachment, direct length reading dial, thread chasing stop, apron controlled leadscrew reverse with automatic stop in both directions, steady rest and follow rest.

Surely, you'll want to know more about this lathe whose features place it in a class all its own. The complete story is in booklet No. 502. Just fill in the coupon and we'll send it gladly.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES



Complete control of the machine is concentrated at the apron which is always convenient to the operator. Besides the usual controls found on conventional lathe aprons, this one is provided with complete control of the four-way rapid tool traverse, the built-in constant surface cutting speed and full electrical control of the speed change and the work drive motor. Add to this also the apron controlled leadscrew reverse.

THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO

Gentlemen:

Please send me without obligation your Booklet No. 502 giving full information and description of the Monarch 13" Model EE Precision Lathe.

NAME _____

COMPANY _____ TITLE _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

BETTER GRINDING AT LOWER COST

WHEN YOU USE *Texaco Grindtex Oil* or one of the soluble oil emulsions recommended for your particular work, you get a marked improvement in results.

Texaco Soluble Oil D, for example, makes a remarkably stable grinding emulsion that keeps the work cool and prevents distortion from frictional heat. It permits grinding dirt to settle out quickly, assuring a wheel that stays free-cutting longer. And you'll get a finish that is rust-free and smoother.

For machines that are hydraulically controlled, make your hydraulic medium *Texaco Regal Oil (R&O).* It keeps systems free from rust, sludge and foam, assures smoother operation.

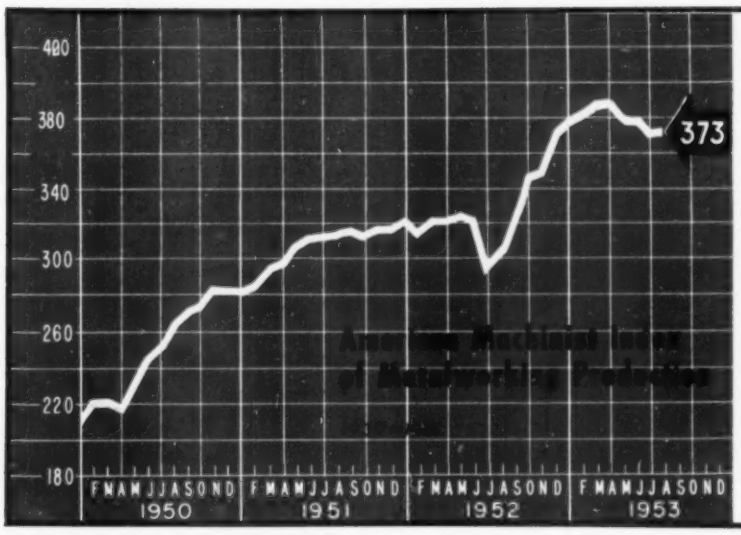
Let a Texaco Lubrication Engineer specializing in metal working help you do *all* your machining better, faster, and at lower cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG '53(*)	JULY '53(p)	JUNE '53(r)	JULY '52
Tot. Index..	**373**	**373**	**376**	**293**
Machinery	331	338	296	
Electrical Machinery	402	415	332	
Autos	324	316	162	
Other Transportation	596	594	538	
Other Metalworking	366	371	287	

(*) Estimated (p) preliminary (r) revised

Metalworking is on a slight downgrade for the fourth consecutive month.

But the current level is only 2% under the March peak — 23% ahead of a year ago.

Short-term metalworking outlook is good, with capital goods production expected to stay at a high-level through the rest of 1953.

Consumer durable goods output, too, will hold up well through the last quarter.

In spite of defense cuts, today's government spending is still enormous compared with any peacetime year.

• • •

Lower-than-expected summer demand for appliances sent inventories zooming.

Appliance output is dropping month-by-month to bring inventories in line with sales.

Even so, current output is 50% more than that for a year ago.

Fall appliance outlook: Washer and dryer schedules will be increased for the rest of the year. Operating rates for freezers and refrigerators will be cut back about 10% from current levels.

Air conditioner production will stay at its present peak rates for balance of the year.

The net result: little change from current output levels for the rest of the year.

• • •

Farm machinery output has dropped off in recent months —with the decline going hand-in-hand with shrinking farm incomes.

But when the results of third quarter sales are in, they may still look good in comparison with 1952's third quarter.

Reason for this is that last year's steel strike cut third quarter farm machine sales volume.

Outlook for this industry is on the gray side. Under present economic conditions the farmer can look forward to lower and lower income. The farm machinery market will fall off too.

• • •

Cleveland area steel makers appear to be in a good position as the fourth quarter approaches. Heavy bookings are reported in this area for pipe, hot rolled bars, sheets and strips.

Pittsburgh steelmen aren't so optimistic. They look for a slow decline in the steel operations rate to about 85% of capacity by year's end.

Steel warehouse operators are getting good delivery on practically all sizes and types.

This means better warehouse inventory balance. And results in better service to small business.

Steel scrap prices are dropping in Chicago, Pittsburgh, Buffalo and Cleveland.

But most mills have a good scrap supply on hand and there isn't much market action.

• • •

During the last few weeks, auto output has averaged about 29% below that for July. GM's production losses alone because of the fire may ultimately run to 100,000 units.

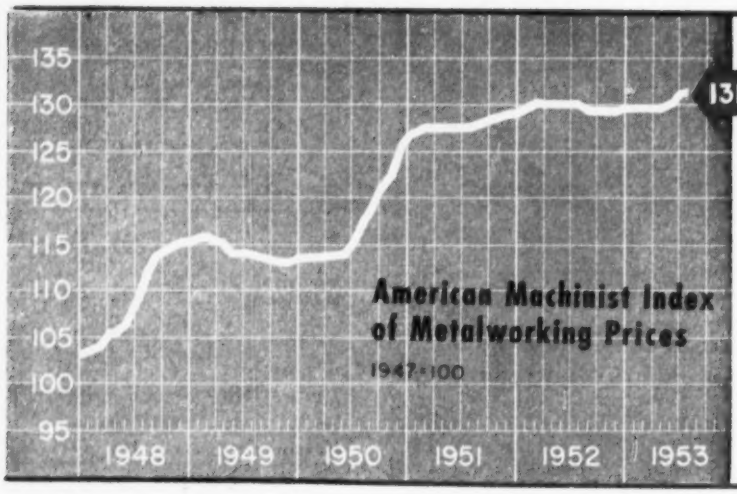
Cleveland parts suppliers report some cancellations because of the fire, plus a few postponements. But this has been more than offset by stepped-up orders from GM competitors.

Chicago area machine-tool companies report an influx of new tool and tool repair orders from GM.

• • •

Metalworking employment broke July records. Although since spring, the number of hours worked has been on the downtrend. Second shifts have been eliminated in many plants.

Gaging Business



PRICE INDEX

	AUG '53(*)	JULY '53(p)	JUNE '53(r)	JULY '52
Total Index	**131.6**	**136.1**	**130.9**	**129.4**
Metalworking Machinery	**140.8**	**140.2**	**137.8**	
Other Machinery exc. Electrical	**135.6**	**135.0**	**132.2**	
Electrical Machinery	**129.5**	**129.3**	**123.9**	
Fabricated Metal Products	**128.5**	**127.8**	**127.8**	

(*) Estimated (p) preliminary (r) revised

Industrial production was on the upgrade in August, rising 5 points over the July figure. But output of durables dropped 2% in August.

On the other hand, nondurables snapped out of their seasonal doldrums and were back at their June levels.

• • •

Manufacturers' inventories increased about $100 million in July. But this represents only one-fifth of the average increase in pre-June months.

At July's end, manufacturers' stocks were valued at $45.6 billion—about $3 billion over year-ago totals.

Manufacturers' shipments totaled $24.5 billion in July, against $20.1 billion in July 1952.

• • •

Cost of living hit a new peak in July, rising .2% to 114.7% of the 1947-49 average.

July marked the fifth consecutive rise in living costs. The Index is 12.7% higher than it was just before Korea in 1950.

High installment borrowing sent consumer credit zooming up $166 million to the $27.2 billion level in July. Auto loans were responsible for most of the upsurge.

• • •

Retail sales, too, were ahead of a year ago. Sales totaled $14.2 billion—6% over the corresponding 1952 figure.

But on the whole, retail sales have been fairly stable since the beginning of the year.

• • •

The employment scene: July set an all-time high in non-farm employment with 49.4 million workers.

Even the summer decline didn't affect the record employment total.

• • •

Average factory worker earned $71.51 a week in July. Lower than in June because of a shorter (40.4 hr) workweek. Weekly earnings were $6.07 over July '52.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	256.6	258.6	241.0
Steel ingot production (thousand tons)	2,150	2,106	2,055
Electric power output (million Kilowatt hours)	8,540	8,432	7,646
Production of automobiles and trucks	155,362	163,635	122,659
Engineering construction awards (*Eng. News-Record*, millions)	273.5	214.3	109.9

MONTHLY BUSINESS INDICATORS

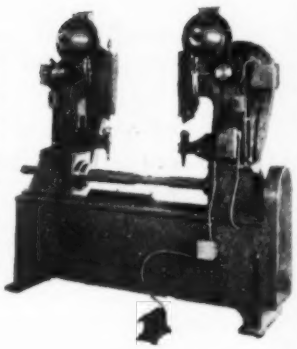
	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	343	318	374
Vacuum cleaners sales (thousands of units)	159	252	207
Washers sales (thousands of units)	228	287	272
Household electric ranges sales (thousands of units)	113	114	88
Radio production (thousands of units)	1,164	1,108	874
Television production (thousands of units)	524	482	361
Foundry equipment new orders index (shipments, 1937-1939 = 100)	446.8	294.4	353.8

* Seasonally adjusted

Speed Production... Automatically with T-J

RIVITORS

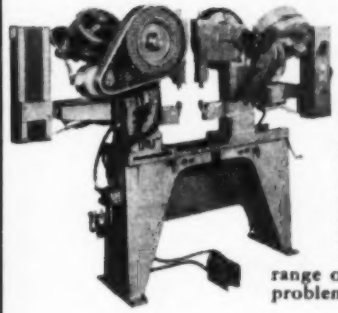
T-J RIVITOR used for automotive clutch plate assembly. Saves time and labor doing a four-fold job—assembling, setting, inspecting and ejecting.



DOUBLE RIVITOR sets two rivets at a time! Equipped with 10" hoppers, and tooled to automatically feed and set two ¼" dia. x ⅝" long wagon box head rivets at a time in elevator chain and raddle or elevator flight assemblies for farm implements. Controlled by one foot pedal.

CLINCHORS

T-J CLINCHOR . . . one of six special 8" throat Underfeed Clinchors used by a large automotive body manufacturer. Feeds and sets 11/16" square cased nuts in outside quarter panels, left and right hand.



DOUBLE CLINCHOR sets two nuts at once! Tooled to feed and set ⅜" x ½" x 1/16" thick Fabri-Steel nuts at each operation. Both Clinchors tripped by same foot-operated valve. Adaptable to wide range of clinch nut setting problems.

Boost production . . . save labor with T-J Rivitors and Clinchors for many assembly jobs today . . . in aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts 3 to 5 times faster! Fully automatic . . . controlled by a single foot pedal! Available in Underfeed and Gravity feed models, throat depths 8" to 36".

T-J RIVITORS automatically feed and set solid rivets . . . with high production! Electrically-powered Rivitor sets 1/16" to ¼" diam. solid steel rivets up to ⅞" long. Air-powered Rivitor sets aluminum alloy rivets up to ¼" diam. or steel rivets up to ⅛" diam. and up to ¾" long. Throat depths 8" to 36".

37 YEARS EXPERIENCE

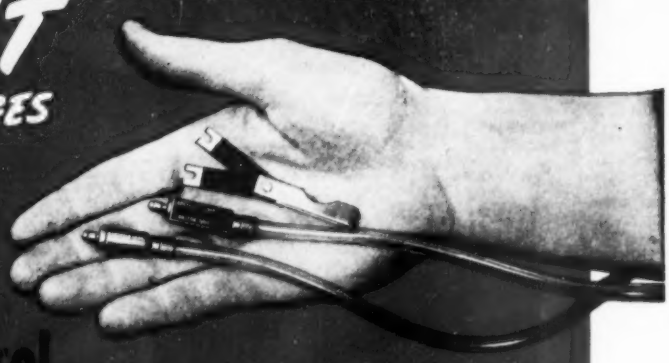
Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

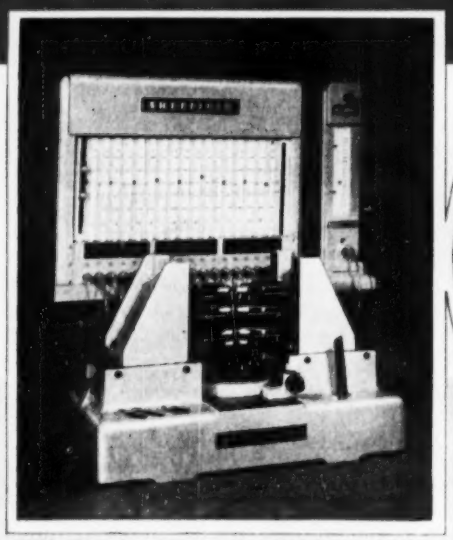
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

PLUNJET
GAGING CARTRIDGES

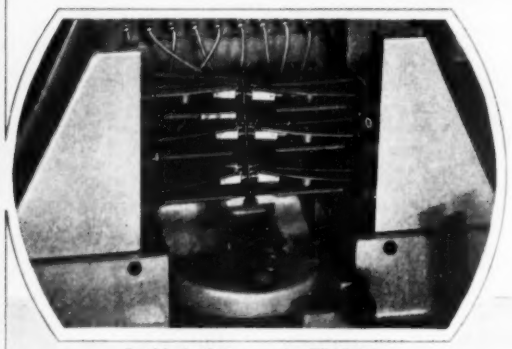
WIDELY USED
For Inspection and Machine Control



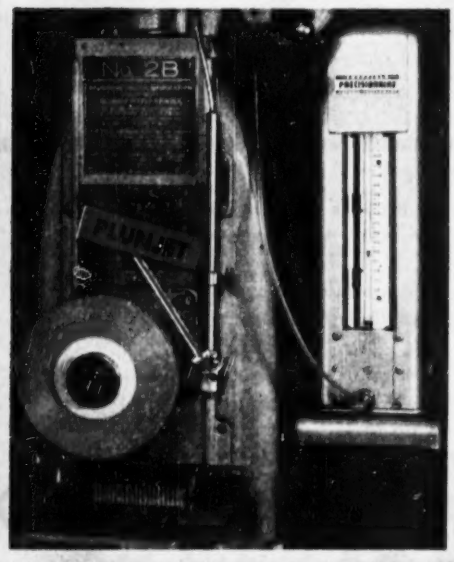
The Plunjet is made with both rectangular and cylindrical short and long housings.



Plunjets with Precisionaire for checking jet engine blades.



Jet blade fixture using Plunjets.



Plunjet feed gage enables operator to grind to a degree of accuracy previously impossible.

PLUNJET GAGING CARTRIDGES . . . the self-contained gaging heads you can use practically everywhere, were developed by Sheffield in 1949.

THOUSANDS ARE NOW IN USE on a wide variety of gaging fixtures and machine control applications.

MORE THAN FIVE THOUSAND are used on gages for checking jet engine blades.

PLUNJET GAGING CARTRIDGES ARE STANDARD LOW-COST STOCK ITEMS which can be applied by users to practically any gaging fixture or machine tool control where indication is required.

WRITE FOR ENGINEERING DATA giving ranges, amplifications, applications, mounting dimensions and prices.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Men Are Important Too

With so much talk these days about the automatic factory, it is popular and quite logical to think of productivity almost exclusively in terms of mechanization.

The men in the shop, however, are a factor of equal importance with mechanization in contributing to greater output per manhour.

These men have a lot to say about what your productivity record is likely to be. Whether you realize it or not, they possess the power to make it look good or bad.

To spend time and effort and money on them as well as on modernizing plant equipment will improve productivity.

The place to begin is with the foreman. In the small localized group in the shop, he is the personal representative of management. If he is a good foreman, he will know more than anyone else, except their wives, about what the men are thinking and what their attitude is.

It is his responsibility to put into practice the policies adopted by management. He therefore deserves management's confidence. And it would seem good judgment to give him a share in making management decisions.

But the foreman is not, and should not be, management's only source of contact with the men in the shop. Smart top management insists upon having direct contact.

A man spends more time on the job than he does anywhere else except at home. If he is a normal person, he naturally has an interest in his job. And that means that he also has an interest in the company for which he works.

That interest should be cultivated. And the best way to cultivate it — apart from high wages, good working conditions and the so-called fringe benefits — is to keep him informed about the company and its business.

The worst thing that management can do is to appear secretive. That arouses suspicion and distrust. And it makes employees feel that they are on the outside looking in. It tends to breed disinterest in the job. Disinterest is hardly conducive to greater productivity.

The best way to win the confidence of employees is to tell them the facts, favorable or unfavorable, about the business. Tell them frequently and in detail. They then will have the feeling that they are sharing in the ups and downs of the company and are being treated as equals.

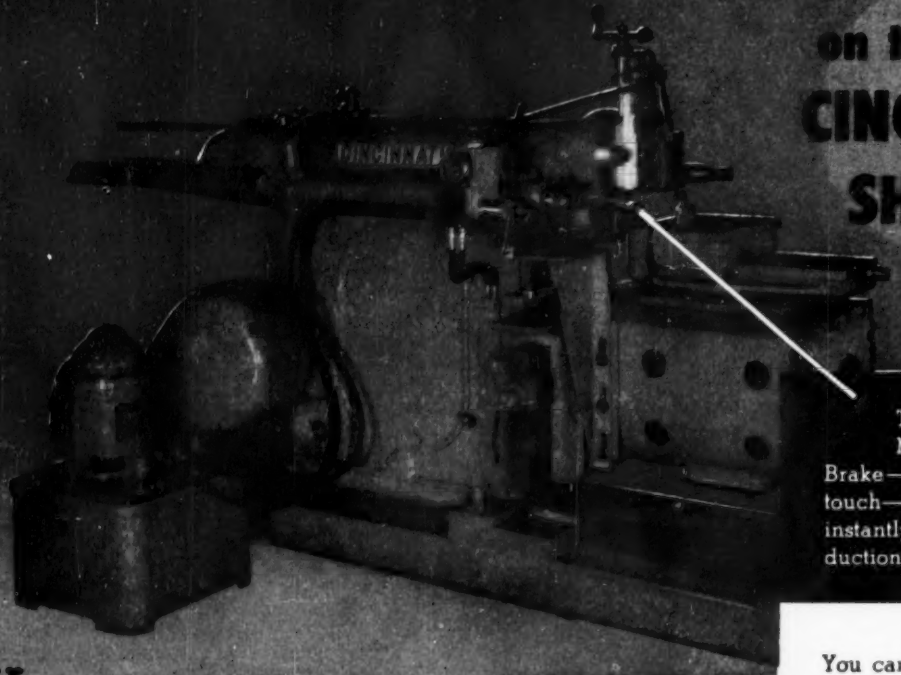
These comments are based upon the experience of many metalworking companies which long have recognized that their employees are even a greater business asset than their machines. Lincoln Electric Co is a prime example.

Too many shops gloss over the importance of the human element and do too little about it. These are the shops that should recognize that productivity is not tied to machines alone, but is dependent upon men of good will.

Burnham Finney

Do STANDARD SHAPING *and* AUTOMATIC DUPLICATING

on the *same* CINCINNATI SHAPER



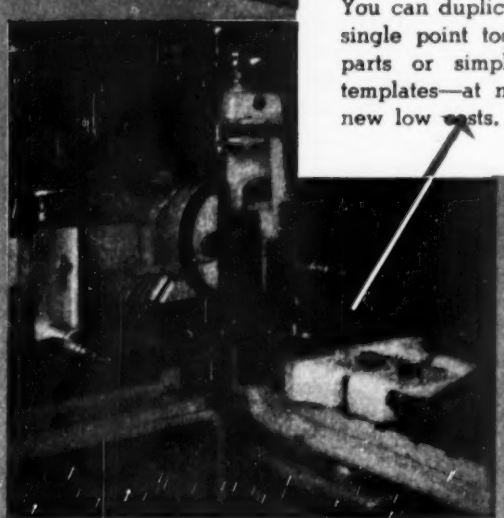
The powerful Cincinnati Magnetic Clutch and Brake—controlled with a finger touch—starts and stops the ram instantly, and speeds production.

YOU can change from Standard Shaping to Automatic Duplicating without a hitch on this hydraulic follower-equipped Cincinnati Shaper. The duplicating mechanism does not interfere with standard shaping operations.

The new Electro-Magnetic Clutch and Brake also brings greater ease of control and greater speed in operation.

A Cincinnati Shaper is the handy man of industry and will be versatile and profitable in your shop.

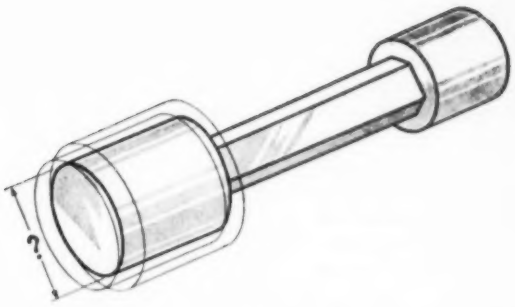
Write for Automatic Contour Duplicating Bulletin DN-1 and Catalog N-5.



You can duplicate parts with a single point tool, using actual parts or simple sheet metal templates—at new speeds and new low costs.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES



how to obtain

DIMENSIONAL STABILITY OF GAGES

Growth or shrinkage of finished gages and machine parts can be prevented or minimized by careful attention to material and heat treatment. Here's the procedure followed at the Naval Gun Factory

BY LT CMDR W DUBYK

Ability of steel gages to maintain dimensional stability constitutes a most important feature. Dimensional stability may be defined as the ability to remain at a given size after heat treating and finishing to final size. Stability should be maintained over a long period of time. Stability is also a prime concern in high-precision tools, dies, fixtures, machine parts and components. The extreme precision now required in certain ordnance components warrants consideration of the same factors affording dimensional stability in gages.

There can be no question as to the desirability of assuring the greatest degree of stability. Once inspected, gages could be stored and ready for immediate issue with no need for reinspection. In a national emergency, the Armed Forces, along with others, could issue large quantities of gages without facing a terrific bottleneck created by recalibration. Delay and expense incidental to repair or replacement of dimensionally unstable gages would be eliminated. The average cost for processing and repair of a gage, if repair is possible, frequently approximates the original cost of the gage. There is also the inconvenience in delay and the expense of reinspection.

The subject of dimensional stability was called to the attention of engineers at the U S Naval Gun Factory in an interesting fashion. The Naval Gun Factory usually procures its gages on a competitive-bid basis, so gages are received from a wide range of sources. After acceptance inspection under accurately controlled conditions, gages are either sent to a Naval Ordnance Inspector for use, or stored for future requirements. All gages are reinspected prior to issue if stored for over two years. For some time it has been evident that a percentage of the reinspected gages were rejected because of permanent contraction or expansion out of tolerance limits. During a recent period this precentage was 12.8% of 966 gages reinspected. The question was then raised as to the relation, if any, between individual sources of supply, and their record on rejection of product due to permanent dimensional change out of tolerance. It is believed that for each manufacturer listed in Table II, a wide range of gage sizes and design was present, so the factors of design and size may be assumed to be relatively constant in each case.

It was interesting to note that of the 139 gages rejected, 88 increased in size, exhibiting the familiar term "growth," while the balance showed a permanent contraction. Each of the manufacturers listed in Table II showed a marked propensity for either growth or shrinkage, indicating some consistency of steel and/or treatment. The average order of magnitude of changes was from 0.0002 to 0.0004 in. per in. The extremes of change noted ranged from 0.000020 to 0.001 in. per in.

The data of Table II appear to indicate that a correlation exists between individual sources of supply and their rejection record of product caused by permanent dimensional change. Some manufacturers appear to have techniques and materials at their disposal that reduce or eliminate dimensional instability.

An example of dimensional instability in the field of component parts has been given in one case with diesel fuel-injection pumps[1]. Components are ground to within limits of a few ten-thousandths of an inch, and are sometimes lapped after honing to provide a close fit. The steel is

treated to a high hardness to take and retain the extremely smooth surface necessary for proper functioning. Malfunctioning of some pumps in service was traced to minute, yet significant, changes in the steel.

Typical instances of growth of precision machine-tool parts, sufficient in magnitude to affect machine-tool performance, have been noted.[2]

TABLE I

Received for Inspection	1123
Accepted	984
Rejects for Instability	139
% Rejected	12.4

OVER-ALL PERFORMANCE of large group of gages reinspected after 2-yr storage.

CAUSE OF INSTABILITY

As a rule, steel gages are required to possess a high level of hardness. The very treatments that make for hard, long wearing gages, however, are likely to be the ones that make the gage dimensionally unstable. Detailed discussion of the structural changes occurring on gage heat treatment can be found well described in references 2, 3, and 4, but a brief description will summarize the main points.

On heating from room temperature, steel expands. At the critical temperature, it undergoes a structural modification, becoming austenitic. Austenite is more dense than the structure from which it forms. Gage steels are usually kept at their austenitizing temperature for a short time until some uniformity of structure and temperature obtains. Exceeding the austenitizing temperature causes a condition conducive to instability. The steels are then quenched to produce the hard, long-wearing product required for gages. The quenched, hardened steel contains some austenite. Austenite is a high-temperature form of steel and would, on slow cooling, be transformed to some normal low-temperature form, such as pearlite. Quenching is a rapid cooling process which, in effect, freezes some of the austenite. The quenched and hardened steel also contains untempered martensite, which has a more voluminous structure than either austenite or stable low-temperature forms of steel. There may be other constituents present in the quenched and hardened steel, but their presence does not affect stability to any known extent.

EFFECTS OF TEMPERING

The quenched product is tempered to restore some measure of ductility without losing too much of the hardness value. Time and temperature of tempering is a function of the type of quench, size of piece, presence of alloying elements, and the length of time economical to the treatment. It serves to decompose some of the retained austenite, as well as some of the martensite formed on quenching. After tempering is concluded, the dimensional stability of the gages appears to be dependent primarily upon three factors.

The first is retained austenite. The quantity and nature of the retained austenite is a function of the steel composition and its heat treatment. The austenite remaining unchanged during quenching decomposes slowly at room temperature, causing minute, but measureable dimensional changes. The size of the product of decomposition, believed to be martensite, is larger than that of austenite, so the steel grows.[3]

The second factor is that of untempered martensite. Martensite remaining untempered after tempering treatment of 300 F or more is capable of transforming slowly at room temeprature. As mentioned above, untempered martensite has a more voluminous structure than the low-temperature, stable forms of steel. Accordingly, retained martensite decomposes at room temperature into a more dense product, hence shrinking. Over-all changes in length observed at room temperature can be considered as an algebraic sum of a contraction caused by the martensite decomposition and an expansion by the transformation of retained austenite into a more voluminous product.[4]

The third factor is residual stress. Any steel part which has been differentially hardened is certain to contain residual stresses. This springs from a number of causes, including differences in cross-section, heating, and cooling. If these residual stresses are present in appreciable quantity, their gradual relaxation would result in dimensional change in finished gages. The nature of the change, however, is usually not a uniform growth or shrinkage, but warpage. Residual stresses do not appear to be as serious a consideration as retained austenite or untempered martensite. Proper control of the latter two constituents affords excellent dimensional control. Dimensional change by warpage has been noted only seldom in stored gages at the Naval Gun Factory.

TABLE II

Gage Manufacturer	Received	Rejects for Instability	% Rejects	Growth	Shrinkage
A	144	44	30.6	35	9
B	23	7	30.4	2	5
C	25	7	28	6	1
D	23	4	17.4	4	0
E	44	6	13.6	2	4
F	32	4	12.5	4	0
G	24	2	8.3	2	0
H	392	21	5.4	6	15
I	44	2	4.5	2	0
J	46	0	0	0	0
K	39	0	0	0	0

PERFORMANCE of different manufacturers represented by more than 20 gages reinspected

PREVENTIVE HEAT TREATMENT

To insure the required dimensional stability in the steel these three operations must be accomplished to the degree necessary: *A*) Decomposition of retained austenite, *B*) tempering of martensite, *C*) stress relieving.

Stability can be obtained readily

by the proper combination of steels and heat treatment. Of particular importance are the final low-temperature treatments needed to carry out operations *A*, *B*, and *C*.

The Naval Gun Factory employs the following analysis in the manufacture of small gages, such as plain plugs:

Carbon, %	0.80-1.05
Manganese, %	1.25-2.00
Phosphorus, % max	0.02
Silicon, %	0.25-0.50
Sulfur, % max	0.03

Standard procedure for making a 1-in. plain plug gage is: Rough machine to remove scale to 0.062 in. oversize. Stress-relieve anneal 1 hr at 1100 F. Rough machine to 0.020 in. oversize. Heat to and hold for 1 hr at 1450 F. Oil quench. Double temper at 350 F for 2 hr, with cooling to room temperature. Sub-cool to −140 F; hold at −140 F for 1 hr. Finish machine and chrome plate.

Gages treated in this fashion have a hardness of 62-63 R_c and periodic checks show an average shrinkage of 0.000030 in. per in. over a period of 1 year.

Details of other American heat treatments for gage steels, including steps for insuring dimensional stability are listed in References 1, 4, 5, 6, 7 and 8. Certain factors appear to be common to successful heat treating of gage steels. These include the carefully maintained analysis of steel, closely maintained austenitizing temperature, and a sufficiently long temper at the proper temperature to insure required hardness and dimensional stability. Many successful gage heat treaters emphasize the importance of the austenitizing temperatures. Indeed the claim is made by some that sub-zero treatments are not required with ordinary tool steels if the austenitizing temperature is controlled. The sub-zero treatment may, however, serve as an insurance to correct inadvertent exceeding of proper austenitizing temperature.

Recently the author had occasion to visit a number of gage manufacturing facilities in England, Switzerland, France, and Germany. Each group was familiar with the phenomenon of dimensional instability and used appropriate measures to control it.

European gage heat-treatment practice appears to parallel American, except that the former does not make any widespread employment of sub-zero treatment. Some English companies employ a 0.95-1.0% C, 0.45-0.55% Mn, and 1.5-1.6% Cr analysis for plug gages. They are austenitized at 1510-1525 F, quenched in oil, tempered at 320 to 355 F for several hours, then stabilized at 300 F for a minimum of 4 hr. The practice of stabilization at 300 F for 4 hr is widely practiced and specified in England, largely because of the efforts of the National Physical Laboratory. This English equivalent of the National Bureau of Standards, Washington, has conducted excellent study in the field of gage heat treatment.[9]

Some Swiss companies utilize a number of steels for gages. A typical composition is 0.9%C. 0.25%S., 2.2%Mn., 0.2%Cr., 0.3%V., and 0.4%W. The steel is austenitized at about 1405 F. Tempering and stabilizing treatments are similar to those employed by the English.

TESTS FOR INSTABILITY

A Military Standard, MIL-G-10944(Ord) of 12 February 1952, provides for stability testing of gage units where deemed necessary. The testing consists of heating the gage slowly to 300 F, cooling to room temperature, cooling slowly to −120 F, and returning the gage to room temperature. The gage is expected to remain within tolerance after the cycles indicated. The opinion has been expressed by some students of steel transformations that the 300 F test temperature is too high. It appears quite probable that 300 F would be likely to temper certain gages of high hardness level. The modification of the Military Standard Stability Test to eliminate possible tempering effects is now under study.

One suggested test proposes the accurate measurement of a workpiece after tempering, followed by a 2-hr test at the temperature specified for stabilization. If no dimensional change occurs, it is reasonable to assume that the workpiece is stable.[5]

It is also suggested that gage blocks can be checked for stability by boiling in a 1% water solution of potassium dichromate (to prevent rusting) for 24 hr. If the change in a gage resulting in this boiling does not exceed 0.000002 in., the gage block is considered very probably stable.[8]

A similar technique has been put into practice by the Laboratoire Central de l'Armement, Paris, France. All purchased gages are first treated at 212 F for 20 hr in a hot-air furnace. Gage measurement and acceptance come after this treatment.

Some interesting tests have been conducted on gages to test for dimensional stability by the National Physical Laboratory in England. X-ray diffraction techniques were employed. It was found possible to distinguish between quenched steels and quenched and stabilized steels. The procedure however, was not precise enough to discriminate accurately between stable and almost stable steels.[10]

Note: Opinions or assertions contained herein are the private ones of the writer, and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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VERSATILE PRODUCER... THE PRESS BRAKE...I

Properly selected press brake does work of two machines

Manufacturers of stamped and formed metal goods have learned that new products, improved quality and reduced costs follow installation of a fully equipped press brake

BY J M MATTHEWMAN, Works Manager, JAMES SMART PLANT, CANADA FOUNDRIES & FORGINGS, LTD

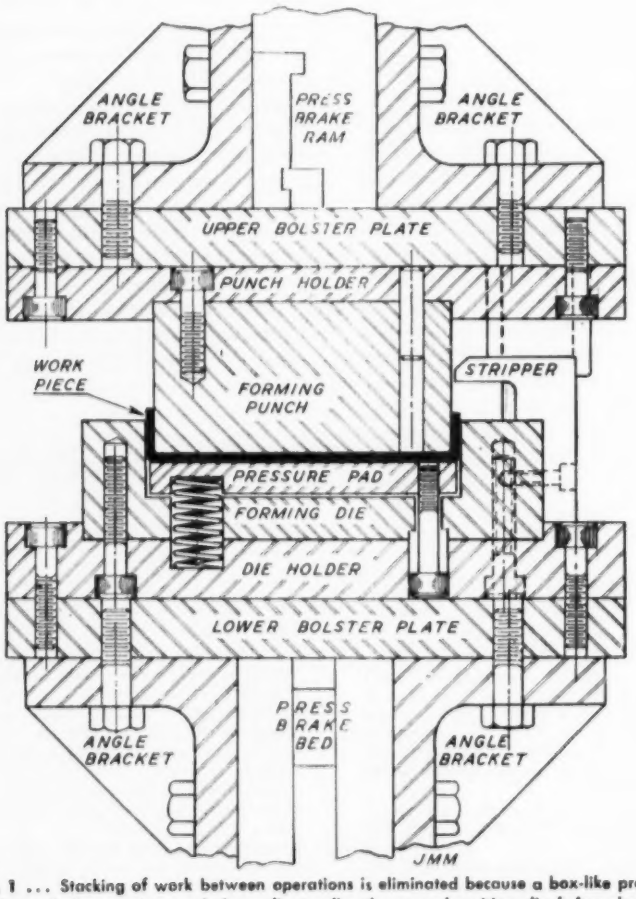


FIG. 1 ... Stacking of work between operations is eliminated because a box-like product is made by passing work from die to die; the second-position die being shown

Recent developments in design, especially in accessory equipment, have extended the general-purpose applications of press brakes. This versatility is of value to all plants, but especially to the smaller ones where processing costs are penalized by short runs, frequent tooling setups, a wide variety of work and a limited capacity range in press equipment.

Modern press brakes are dual-purpose units. They can be fitted to perform punching, notching, blanking, drawing and forming. In addition to accommodating standard and special tools to form hundreds of different shapes in sheet metal, press brakes can be adapted to use punching units or regular stamping-press die sets. These convertible press brakes, with accessory equipment to employ their complete capacity range, frequently save many thousands of dollars for the fabricator who requires both a press and a brake.

This case, observed in a small metalworking shop, is typical:

Equipment required for two jobs, one a new product. Both needed only part-time machine capacity.

First equipment proposal: 150-ton punch press, bed area 40 x 24 in.; cost—$22,000. 75-ton press

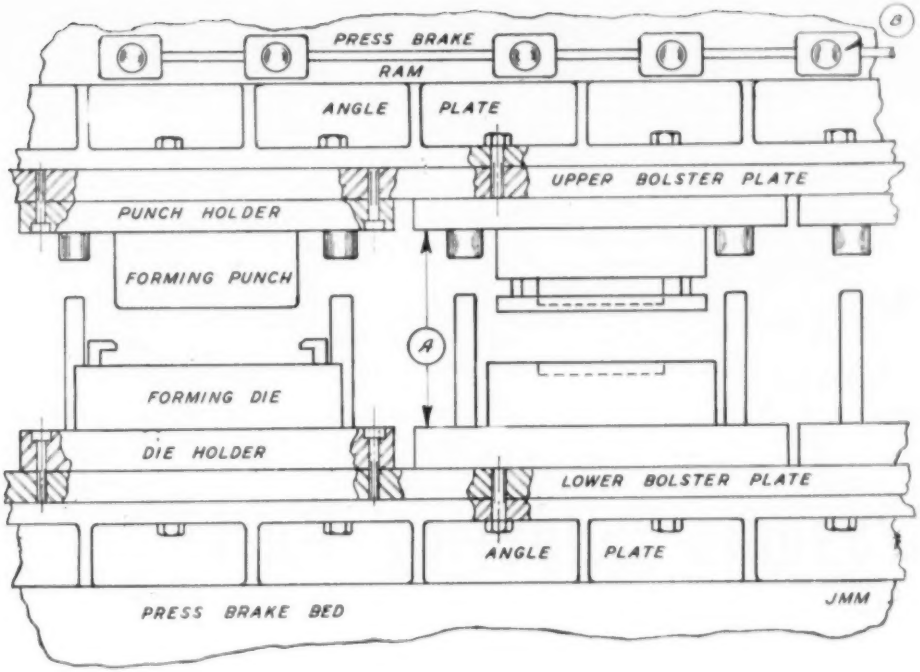


FIG. 2 ... Four die sets (two shown) set up on a press brake enable one machine to do the work of four presses, promotes a working rhythm leading to higher production

brake; cost—$7,000; total capital expenditure—$29,000.

Operations required in punch press: 4 separate setups.

Processing labor, including handling of bulky parts between operations—9 manhours per 1000 pcs.

Alternate Equipment Proposal: 150-ton press brake, 2-speed, dual-purpose; cost—$18,000.

Processing labor, all four dies in one set up, with four operators: 4 manhours per 1000 pcs.

Total work load wtih these four dies is 126 tons; and the dual-purpose press brake on this job is also available as a brake with double the tonnage capacity of the 75-ton unit considered for forming work only.

Fig. 1 shows detail of the second-position die to turn up all edges of a tray-shaped product from a flat steel blank, which has been corner-notched and sheared from the strip in the first-position die. A pattern of louvres is cut and formed in the third-position die; and final punching work is done in the fourth die. Four operators feed this progressive job, from left to right, and thereby eliminate all intermediate stacking of work between each of four separate operations as when a punch press is used.

Surveys in plants having a wide variety of stamping and forming work indicate that the most useful press brake equipment is that which is fitted with these features.

Two-speed drive: In the 150-ton capacity range this speed selection is usually 8 and 24 strokes per min. The slower speed is better for heavy forming of large sections and the faster speed gives maximum productivity from punching units or regular press dies.

Angle Plates and Bolster Plates: These accessory parts convert a press brake to accommodate punching units or die sets. A guide-pin die set is required to use one or more of the individual punching units of the two-piece type; but a T-slotted plate may be attached to the bolster for setups of self-stripping, one-piece punching units.

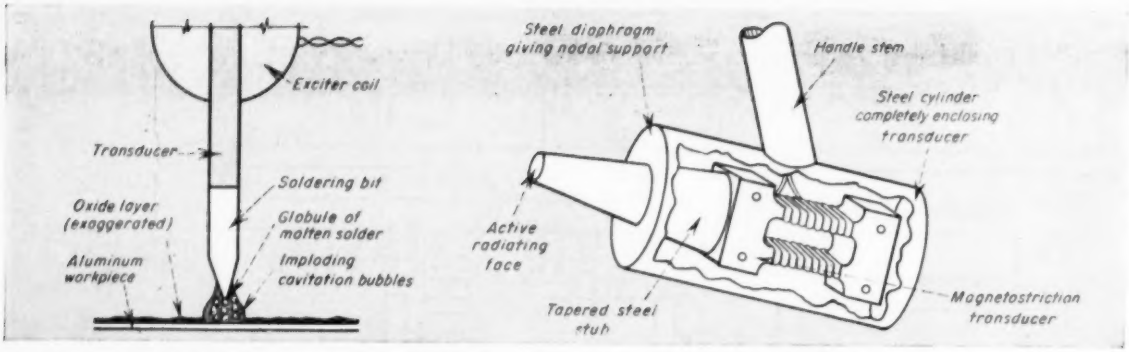
Motorized Ram Adjustment: This feature, plus micrometer indicating gages, permits rapid and accurate die setting. The job setting shown on the indicators may be stamped on the dies as a permanent record for subsequent production runs.

Safety Controls: (See *B* in Fig. 2.) Interlocked safety controls require each operator to close a contact button with each hand before the press brake can start its stroke. If any button is released, at any point in the stroke cycle, the ram will stop. This hook-up is not effective on jobs where the operators must retain their hold on the workpiece throughout the stroke. However, the interlock safety controls may also be used through an electric foot control for the lead operator.

Die Equipment: (See *A* in Fig. 2). A group of press dies for use in a progressive setup in a press brake must have identical shut-height dimensions. Shims may be used to correct differences in shut-height, usually to compensate for regrinding one die in a group.

Individual punching units, notching units, stock guides and stops are ready-made tools adaptable to an endless variety of job setups. They may be fitted to the press brake bed by use of adapter plates also supplied by the punch makers, arranged in job patterns on a T-slot plate, or grouped in a guide-pin die set.

Metal fabricators, whether or not they now use press brakes, or to what extent they now use them, would find profitable results from a thorough review of the capacity and the adaptability of these versatile machines.



ULTRASONIC TINNING ACTION results from the violent implosion of bubbles which quickly erode the surface oxide layer

COMMERCIAL HAND IRON designed for ultrasonic soldering of aluminum and other hard-to-solder metals

How Ultrasonic Soldering Works

It looks like magic when ordinary solder can be made to stick to aluminum without tedious cleaning and scratching. The explanation is quite simple when you understand the principle

BY LEO WALTER, Consulting Engineer, CHELTENHAM, ENGLAND

Joining of metals by use of a lower melting-point metal has been known for many years. Essentially the process consists of obtaining a wetting or flow of solder over the surface of the metal and effecting a joint by flowing together two such surfaces. Strength of joints made by this means is mainly dependent on solder strength, and many variations of its composition are possible. Melting points can range from 175 F to 930 F, and metals used include tin, lead, zinc, cadmium, copper, and many alloys made up of combinations of these metals.

Surface wetting of a metal by the joining medium is usually dependent on the finish of the surface. It must be absolutely free from grease or oxide film; this is usually brought about by use of a flux. A flux normally performs this function by dissolving or inhibiting the oxide, and it must be in a form that continues to be active at the temperature of soldering, as new oxides will be formed at such temperatures.

Many metals do not present difficulty in soldering, as their oxides can be easily removed by various compounds, but some materials, such as aluminum, cannot be treated in this way because of the chemical inactivity of their oxides. Other means of removal must therefore be employed. Many methods have been suggested.

Basically, these methods have consisted of a mechanical abrasion of the oxide surface under conditions where re-oxidation cannot take place. One method is to form a pool of molten solder on the surface of the metal, then to scratch the surface below the solder with a wire scratch brush. This produces a bond, but is dependent on the number of individual scratches in the oxide film.

ULTRASONIC TINNING

If a diaphragm is set in vibration it will produce a sound wave. These sound waves can be of a frequency above those to which the human ear is sensitive and are then known as ultrasonic waves. The effect of such waves in a liquid is to produce a large number or high-pressure implosions of bubbles in the liquid. If a surface is immersed in the liquid the small implosions will abrade the surface. A large number of these implosions occur under normal conditions, and a soft material is rapidly eroded away if the ultrasonic intensity is high enough.

The Mullard ultrasonic soldering iron and ultrasonic tinning bath operate on this principle. In the case of the iron, the soldering bit is vibrated at a high frequency supplied by an electronic generator. When the bit is covered with molten solder and applied to a surface, the erosive action accurs through the medium of the solder and erodes the surface. If the surface is of a metal that is capable of being tinned, the oxide on that surface will be abraded away, and a wetting action will occur.

The tinning bath operates in the same way, the vibrations being applied to the bottom of the bath and producing the implosions

throughout the molten solder. Articles dipped into the bath are thus subjected to the eroding action, and wetting or tinning results.

There seems little doubt that this process of tinning by ultrasonics depends, not primarily on the mechanical vibrations themselves, but on their ability to set up cavitation in the molten material. This cavitation is responsible for most of the well-known disruptive effects of high-power ultrasonics. It occurs whenever a pressure wave of sufficient intensity is set up in any ordinary gassy liquid, including molten metals.

If the amplitude of the pressure wave is allowed to become greater than the static external pressure (normally one atmosphere), the many small bubbles normally present in suspension in the liquid are forced into violent radial motion. The bubbles expand rapidly as the liquid pressure starts to go negative and collapse again during the positive cycle, and the rapidly moving liquid in the immediate vicinity of the bubbles exerts enormous local pressures often capable of causing severe damage to any solid surface on which the bubbles happen to be occluded.

UNWANTED CAVITATION

This problem of cavitation is encountered in any liquid system whenever a tension tends to be set up in it; in hydraulic machines, for example, the enormous cavitated pressures often exceed the fatigue strength of the metals used, with the result that, for example, ships' propellers and turbine blades are slowly eaten away by the accumulation of small holes torn into them.

Similarly, if an ultrasonic vibrator (or transducer) is made to operate at high power into a liquid in contact with a metal surface, this type of erosion may start both at the transducer face and on the metal. The effect is, of course, often a great nuisance and care must be taken to choose a resistant material for the transducer, or couple the vibrations from it to the liquid through another more-resistant metal.

Ultrasonic cavitation sets in at lower intensities in molten metals than in other less-dense liquids so, for a given ultrasonic power, the violence of cavitation and its erosive effects can be expected to be greater. From this we can see how it is that, when a solid metal surface is covered with an unwanted film of impurity or oxide, this can sometimes be removed by exposing the surface of the metal to cavitating solder. The process becomes feasible without damaging the metal only if the film is less resistant to erosive action than the metal itself.

This process of selective erosion can obviously be applied, not only to the easy soldering of difficult metals, but also in a more general way to the removal of solid impurities from the surface of any metal which is itself sufficiently corrosion-resistant.

It will be seen then that the ultrasonic soldering method is simply a technique for removing the oxide layer as an alternative to the normal scratch brush. At ultrasonic frequencies the oxide obviously has not time to reform before the solder can flow in to effect the alloying with the clean metal surface, even though the cavitation bubbles themselves generally contain oxygen.

The ultrasonic method is more successful for the purpose than manual abrasion, as the oxide is removed from the whole of the metal surface in the active cavitating zone of the solder, whereas in the scratching method, the effect is often merely to expose a number of scratching lines for keying the solder in, so the whole surface can hardly be said to be covered.

SMALL ACTIVE AREA

The cloud of cavitation bubbles in front of the vibrator has the effect of scattering the ultrasonic beam, attentuating it seriously, so the active zone is normally confined to the immediate vicinity of the vibrator. This means that, if it is required to tin a large area of metal, it will be necessary to move the vibrator over the entire surface, always with a molten solder bond; but it is never necessary actually to touch the surface, as with the scratch brush.

The nuclei necessary for cavitation will always be extremely numerous at the phase boundary between the liquid solder and metal, where they come out of solution as occluded bubbles. Measurements show that erosion of the oxide over the whole area in the active zone actually occurs extremely rapidly; under typical conditions, effective tinning can be obtained in less than 1/20 sec if the surface is first allowed to reach an appropriate soldering temperature.

ULTRASONIC TINNING DEVICES

With modern resources it is a comparatively simple matter to generate mechanical vibrations of a suitable frequency and at sufficient power to produce intense cavitation in molten solder. There is a choice of several types of generators but, from the very earliest experiments, magnetostrictors have always been preferred for these soldering applications.

There are, of course, good reasons for this choice: not only are these vibrators easily constructed to operate at suitable frequencies, but they are the only type that can be made to vibrate really efficiently at the high temperatures normally required.

Magnetostrictors use the property, which ferromagnetic materials possess, of changing their physical dimensions when subjected to a changing magnetic field. The simplest practical vibrator of this type consists merely of a rod or tube of a suitable metal, such as nickel, which is excited electrically to vibrate at its natural mechanical resonant frequency. Intense vibrations can be obtained in this way, but such simple devices are inefficient if required to operate at high power.

Vibrations used in the more recent types of soldering devices, although similar in principle, differ considerably in their constructional details. For example, the accompanying sketch of a typical vibrator of this type uses, for greater efficiency, a laminated structure having a closed magnetic circuit and wound with a toroidal coil. This is made to carry a direct current for biasing purposes and an alternating drive current of suitable value at the correct

frequency for resonant excitation of the stack. The transducer vibrates as a half-wave resonator with maximum movement at the two free ends and with a node at the center.

In soldering applications, the essential requirement is a vibrator capable of producing violent cavitation in molten solder. On investigation it is found that cavitation tends to increase in intensity as the operating frequency is reduced and, for economy in power, the aim must be to keep the frequency of the transducer as low as possible.

On the other hand, it is definitely not convenient to take the frequency into the audible range, for sound waves of such high intensity would have a serious nuisance value; also at lower frequencies resonant magnetostrictors become large in size and unwieldy. The vibrator used in practice is therefore kept just ultrasonic, at frequencies above the audible limit (16 kc/sec) but generally below 25 kc/sec.

These general design features have been incorporated in practical ultrasonic tinning devices. In the pioneer experimental models, simple nickel rods or tubes were used as vibrators and driven at considerable power. By comparison, with a modern commercial type of ultrasonic solderer intended to be used in the same manner as a conventional hand soldering iron, not more than about 50 watts of power at the appropriate frequency (22 kc/sec) is needed for excitation, and this is obtained from a small electronic drive unit.

A feature of this particular device is that self-excitation of the vibrator is used to eliminate all manual controls: the drive current for the transducer is obtained by amplifying a signal derived from the motion of the transducer, using a variable reluctance pickup device fixed behind the transducer laminations.

This is an obvious simplification in an instrument intended to be used by unskilled operators. If it becomes necessary to change the shape or size of the soldering tip to suit any particular job, this can easily be done by a simple brazing operation, but care is necessary in choosing suitable dimensions as, of course, the stub should remain resonant, or approximately so.

An important factor to be borne in mind is that when using the iron, tinning will occur only in the immediate region of contact. Soldering methods employing capillary flow to obtain coverage cannot be used. A second factor, common to all soldered joints in aluminum, is the possibility of electrolytic corrosion of the solder or the base metal in the presence of moisture, but this can be lessened by using tin-zinc instead of the usual tin-lead base solder and largely eliminated by protecting the joint from moisture.

A modification of the driving system used in the soldering iron is employed in the construction of the Mullard ultrasonic tinning bath, developed for soldering small and complex shaped objects. The soldering bit is replaced by an electrically heated bath containing molten solder. The transducer injects an intense ultrasonic energy through the bath; thus, when the aluminum is dipped into the bath, the oxide film is eroded away by agitation of the molten solder.

LARGE UNITS

Larger transducer and generating units have also been developed which may be incorporated into existing solder baths without elaborate modifications. The work to be tinned must be in close proximity to the face of the transducer to obtain maximum erosion. Tinning of relatively large areas may be accomplished by passing the work through a trough of solder in front of the transducer; by moving the transducer over the area to be tinned which is immersed in solder; or by arranging a bank of transducer units driven by a large generator.

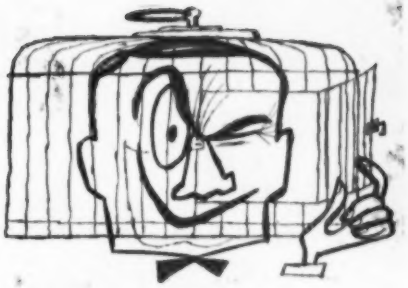
PRODUCTION-LINE METHODS

With this type of unit it is possible to pre-tin relatively large aluminum parts, either wholly or partially, so conventional soldering irons can be used during production. Pre-tinned aluminum wire, for instance, could be soldered at any point with a conventional iron and solder, and the pretinning operation could be accomplished by mass production methods in an ultrasonic trough.

It can be appreciated that ultrasonic tinning and soldering techniques may lead to many increased applications of aluminum, particularly in the electrical industry. There are, of course, limitations to the applications of ultrasonic soldering, and the method certainly cannot replace welding and riveting techniques. But, in cases where the process is economically sound, it can solve many existing difficulties.

"They're zirconium metal bars which are lighter than steel and don't absorb neutrons to interfere with atomic fission taking place in the reactor, or sumpthin'—How would I know, I'm only the janitor."

Be cagey with titanium



Don't get stuck with titanium-working methods which may later turn out to be second-rate. There's still a long way to go before all is known about this new material . . .

BY JOHN A BOYD, Vice President, VAN STRAATEN CHEMICAL CO

So little titanium has been machined in the two or three years since the material became popular, that there hasn't been time to find the best machining methods. From a few initial efforts, several theories have been developed, and some plants have locked themselves into the wrong tooling and the wrong cutting fluid.

It may be another two years before we have enough experience to establish "best" methods and materials for quantity production.

A few examples can show how confusing the initial work has been. At the same time we can see a few basic facts that have shown up.

For instance, in one of the first tests on vertical broaching of titanium, the plant tried cutting oils that had been successful on 18-8 stainless. Various tool grinds and speeds were tried, all without any success.

In a last-ditch effort, a directed stream of liquid CO_2 was tried, and a completely satisfactory finish was attained. (Broach life was not measured in this test.)

It is interesting that in this experimental work, water-solubles for broaching were completely omitted. The reasoning was the commonly accepted idea that if a good broaching oil failed to give results, a water-soluble material would also fail.

This reasoning is apparently wrong. The work with CO_2, and its superiority over oils, showed that *the lowest possible tool temperatures are essential when machining titanium.*

It was not until two years had passed that a plant which had been chain-broaching titanium blades with CO_2, tried a newly-developed heavy-duty water-soluble. With the soluble they got *better* tool life and finish than with CO_2.

Here again it was shown that low tool temperature was a primary requirement.

A few months later, the same heavy-duty soluble was tried on a vertical broach. This time it was compared with broaching oils, and the oils outperformed the soluble. Better finish was obtained, and it seemed that oils were better. However, chatter marks showed up on the work when the broach was run at higher speeds. These marks indicated a lack of rigidity in the machine setup, which could account for the failure of the soluble, and the success of the oil.

On another vertical broach doing cutoff operations on jet blades, the lack of rigidity in the fixture caused a deviation of 0.004 in. in length on the titanium blades, but tolerance was only ± 0.0005 in. Steel blades broached on the same setup varied only 0.00025 in. from exact size. Here oil again outperformed water-solubles on titanium, but the most important fact learned was that this setup was rigid enough for steel, but nowhere nearly rigid enough for titanium.

These examples pointed up the second basic concept: In machining titanium, extreme rigidity and freedom from tool rubbing must be assured. Otherwise tools may seize, leading to improper selection of a coolant. In a loose machine, an oil will tend to hydraulically dampen vibration and lessen bad effects. However, it is a move in the wrong direction.

In one experimental setup on machining titanium, the effect of better machine rigidity has given a five-fold increase in tool life.

This increase will take place in production machining. If machine rigidity is not properly maintained, conclusions about tool design and coolant may be completely wrong.

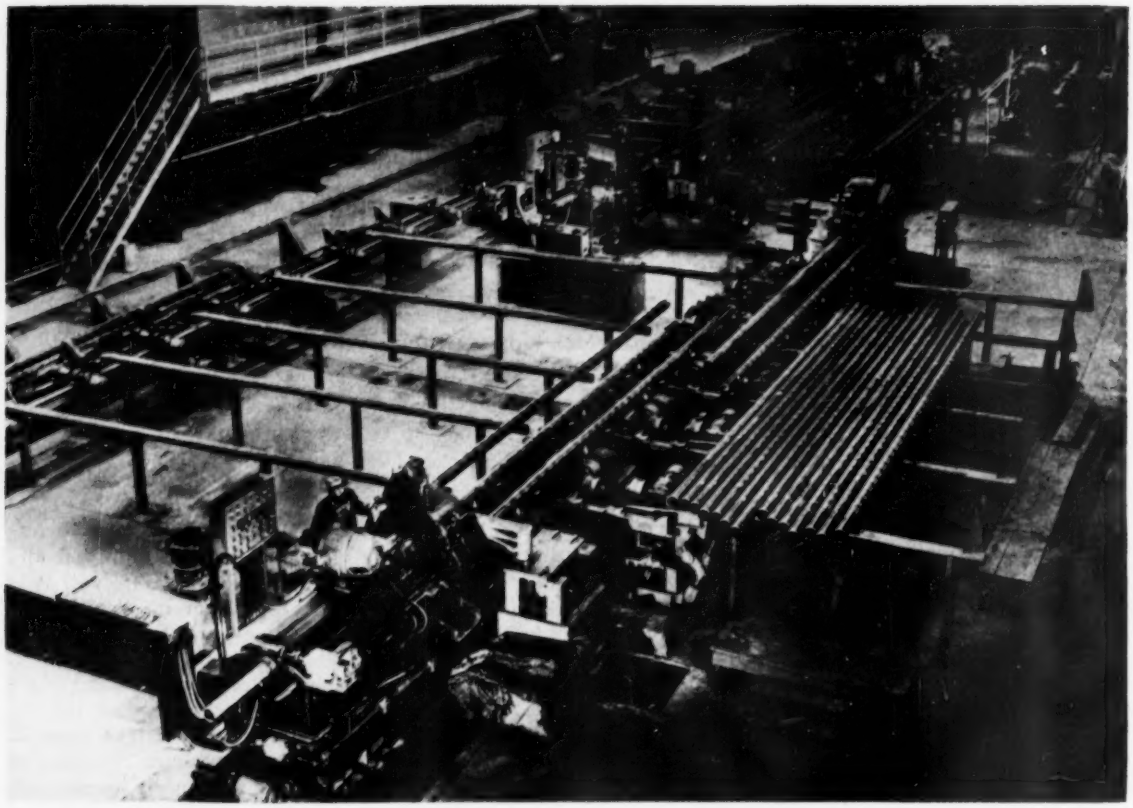
So far, we may accept two important, basic conclusions about machining titanium:

1. Extreme rigidity is absolutely necessary for satisfactory working of titanium.

2. Selection of cutting fluid must emphasize cooling, rather than lubrication.

When rigidity is lacking, because of wear or a faulty setup, oils will give better results than heavy-duty water soluble compounds, because oils can better cushion the effect of side rubbing. But with a rigid setup and machine—with rubbing stopped—proper solubles can outperform straight oils.

Perhaps the most important lesson to be learned is to make no definite rules for machining titanium until large-scale testing and operations have proved your methods. Any company that tries to draw a conclusion based on a short experimental run may end up with methods and materials that will prevent successful large-scale machining of titanium.



CASING ARRIVES as semi-finished seamless-steel tubes from 28 to 48 ft long and 3½ to 7 in. OD. Ends are cut square and chamfered. First step is to Taylor-Wilson automatic feed tables which carry it as shown here to either of two pairs of Stamets threaders. The tube moves across the table to a stop plate on the far threader, then in for the close-tolerance threading, out again to cross the table downward to the stop on the near machine and in for threading and out on to a lateral conveyor. All operations are completed in about 75 sec per casing, under control of one operator in the foreground, who also inspects finished threads

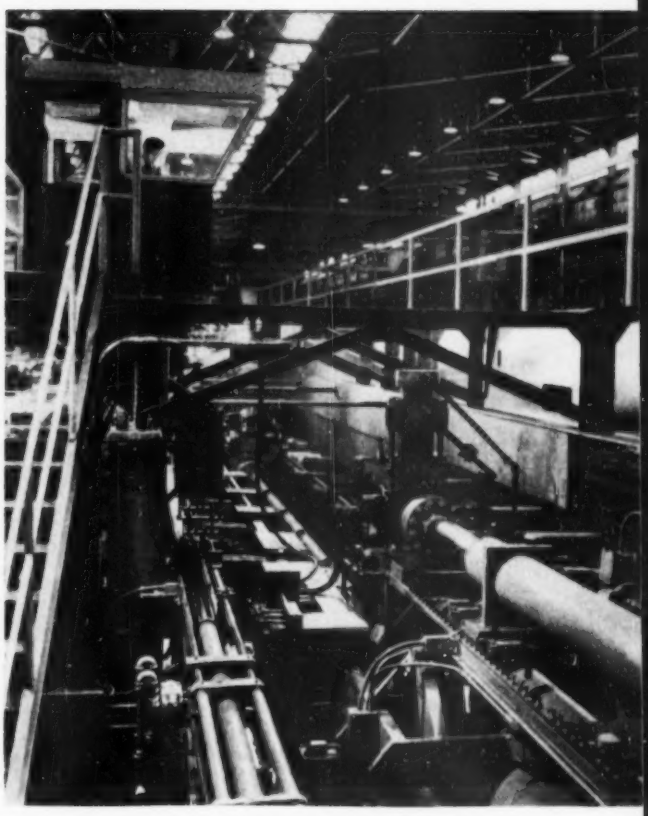
Oil casing by the mile...

AUTOMATICALLY

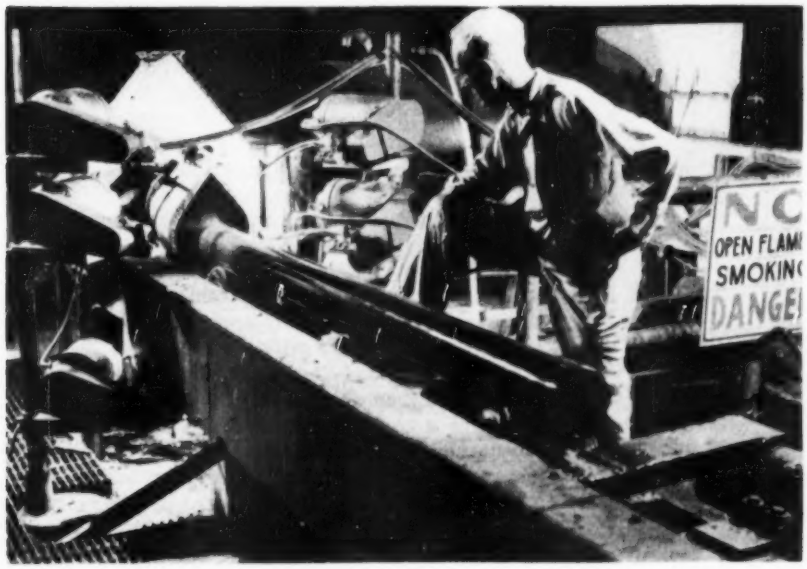
Threading, coupling, testing and painting are all done automatically in the new Casing-Finishing Dept of Pittsburgh Steel at Allenport, Penna. Special machines do the job in this $2-million plant

AUXILIARY EQUIPMENT . . . Couplings are produced in the same 120 x 660-ft building in a department with two Bardons & Oliver cutoff machines, four Stamets boring machines, nine Stamets tappers (with collapsing taps and built-in rollover vises), and a new galvanizing line (threads on couplings are galvanized to prevent galling). Output serves the casing line, oil-well tubing dept, and other users

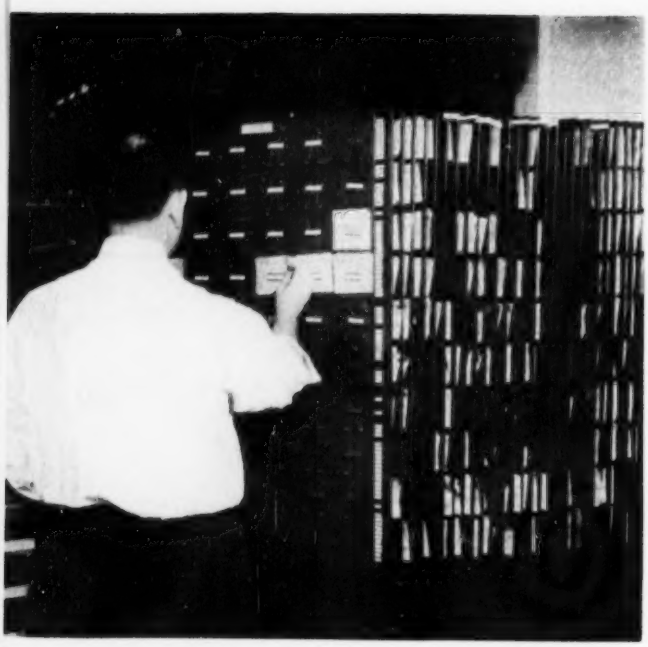
THREADED CASINGS move along the roller conveyor to pickup arms at adjacent table. Here couplings are hand-started on one end and casing rolls on to a lateral conveyor which carries it into this United Engrg & Fdry automatic screw-on machine, first of its kind. It grips the coupling in the far chuck, the casing in the near one, then rotates the coupling to a predetermined torque load, varying with size and grade of casing from 4500 to 7000 ft-lb. Load is set on panel at right, which also records each operation. Casing is released, moves back, then off to lower left ready for hydrostatic test



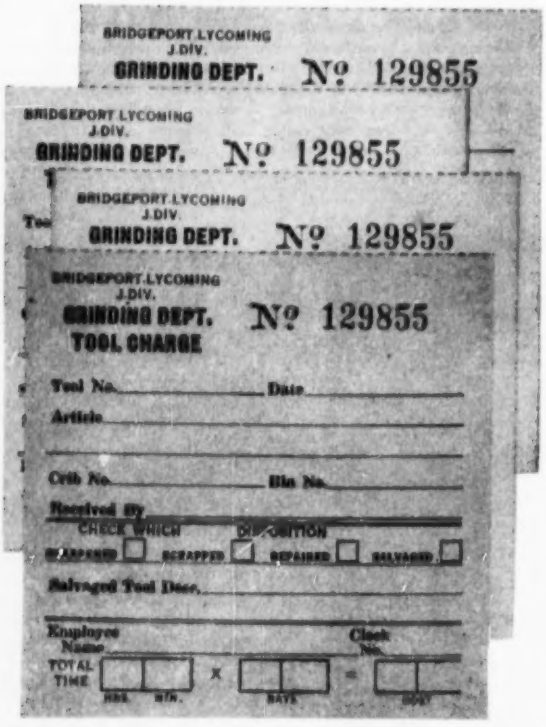
WITHIN HEAVY METAL PROTECTIVE SIDE DOORS, casing moves into the cradle of this Taylor-Wilson automatic hydrostatic tester. End plugs move in, clamps close over it, and soluble oil-water mixture pumped in. Pressure rises to as high as 10,000 psi, with automatic kick-in and kick-out at 3500 to 4000 psi, a common specification. After test (which operator in cubicle above merely observes), plugs are withdrawn and casing rolls through opposite door for drainage and application of protective cap on uncoupled end



LENGTH IS MEASURED on a bench with a stop and built-in scale, and this, diameter, and test pressure stenciled on. Then the length passes through this Gyromat machine which applies a protective coating of lacquer. Thickness is adjustable, and a 32-ft casing can be coated in 5 sec. Total processing time is 10 to 15 min per casing, and production is as high as 100 pc per hr



TICKETS ON EACH CLIP OF THIS DATE BOARD *represent one day's delivery of tools to be sharpened. A glance at the board tells the load on cutter grinding, because tickets are removed as tools are returned*



GRINDING-DEPARTMENT TOOL CHARGE *is filled out by crib attendants for every tool to be sharpened. Each of the four carbon-backed copies of the ticket has a different color, serves a special purpose*

WHAT IS YOUR

One problem in a new plant is the lack of adequate cost information. A recently established Avco plant set up this system to determine its cutting-tool regrind cost and to locate tools in the regrind cycle

BY EARL L DANGLE, General Supt, Subcontract, and
JOSEPH J DEMCHAK, Tool Supervisor, Jet Section of BRIDGEPORT-LYCOMING DIV, AVCO MFG CORP

Grinding costs and inventory of cutting tools are controlled by unique application of a standard record system at Avco Manufacturing's Bridgeport-Lycoming Division, Stratford, Conn.

This McCaskey-developed system shows tool sharpening cost, location during the grinding cycle, cutter inventory, and other valuable facts.

Because tools are always accounted for, less time is lost through incorrect routing, and no tools can gather dust in a corner of a department.

Detailed studies of tool costs can be made whenever wanted, with no change in routine.

The system was installed with no increase in personnel, because employees make up these records in their slack time. After records have served their purpose, they are automatically thrown away.

HOW THE SYSTEM WORKS

When an operator has a tool to be reground, he exchanges it at the crib for another tool of the same type. No additional checkout is needed, because net crib inventory does not change.

Tools accumulate during the day, and crib attendants, in their spare time, fill out a 4-copy form for each tool to be reground.

The orange ticket goes on a standard date board, recording the date sent to regrind. The pink ticket is clipped to the crib inventory card, which then indicates how many tools of that type are being sharpened. Tools with their green and yellow tickets are then sent to cutter grinding.

The cutter-grind foreman checks arriving tools and assigns them to various operators. Each man is given the green ticket which goes with the tool to be sharpened. When finished grinding, the operator marks the ticket with the time needed for the work and puts the ticket on a clipboard by his machine. These boards are picked up every night and the information on them is recorded on master sheets. The

TOOL-GRINDING COST?

green tickets are then automatically thrown away.

The sharpened tools with their yellow charge tickets are taken back to the originating crib. Here the yellow slip is used to cancel the date board and inventory records and the tool is shelved for reissue.

HOW EACH TICKET HELPS

Each copy of the form does several things.

The date board tells the tool supervisor at a glance how quickly tools are being returned from grinding. It also shows when a heavy load is expected in the grinding department, and warns tool handlers when to give more urgently needed tools special attention.

From the green ticket, the cost of grinding each tool can be found by multiplying the operator's rate by the time spent sharpening the tool. Also, the cutter-grind foreman can, by scanning the tickets, get a good idea of the efficiency of his men. Thus the form serves as one factor in a merit-rating system. And if a tool regularly costs more than it is worth to production, suggestions can be made to redesign the tool to simplify sharpening and reduce costs.

Cost information is generally kept for one or two months and discarded. After that time it would probably be out-of-date.

The pink inventory ticket tells how many tools of any particular type are at cutter grinding. This information helps keep inventories at a working minimum, as usual practice is to buy more of the tools which keep running out on the shelves. Actually, there might be enough of such tools if they were not delayed in regrind.

REPAIRS AND SALVAGE

Often a tool will arrive at cutter grinding too worn to be sharpened for its original purpose. Then the foreman will decide whether the tool should be repaired, scrapped, or salvaged. If repair will restore the tool to its original design, the work needed will be marked on the green ticket and assigned as before.

Often a tool cannot be repaired to specification — for example, undersized reamers and drills—but can be saved for another job. If so, the green ticket is marked with the work to be done, and the yellow ticket will note the change in purpose. When the tool gets back to the crib, its pink inventory ticket is removed, the inventory is reduced by one tool, and inventory for the resulting tool increases.

BROKEN OR DAMAGED TOOLS

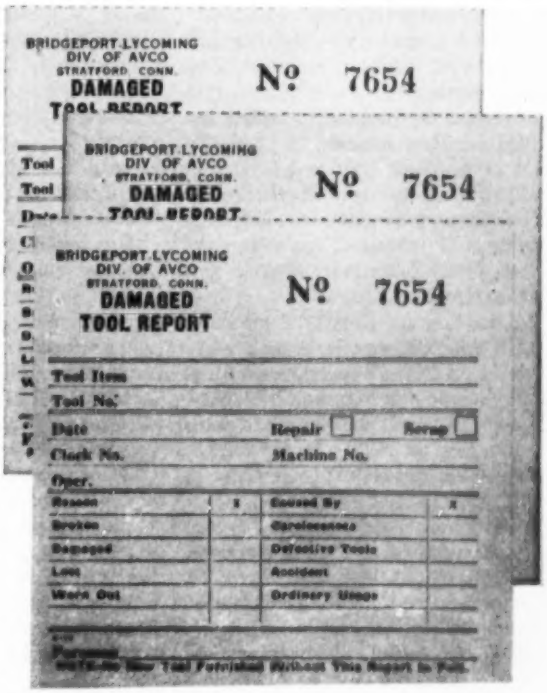
For broken tools, a damaged tool report is used. These forms are kept in each foreman's desk, and must accompany any broken tool to the crib.

Cause of trouble is marked in the appropriate box on the form, and the tool is sent to cutter grind to see if it can be used in any way. If not, the green copy of the damaged tool report is stamped "Scrapped" and initialled by the foreman. The tool and all three copies of the damaged tool report are returned to the crib. All copies of the grinding department tool charge are cancelled, and crib inventory is reduced accordingly. Tool is then sent to salvage department.

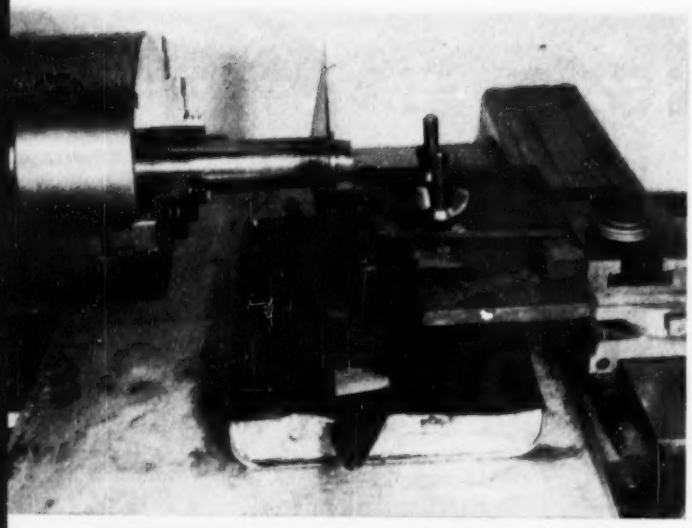
The yellow copy of the damaged tool report is sent to master inventory control, and inventory for the scrapped tool is reduced.

From pink copies of damaged tool reports is typed a daily summary of all such tools. This report is investigated by the tool supervisor every day to see whether damage could have been avoided.

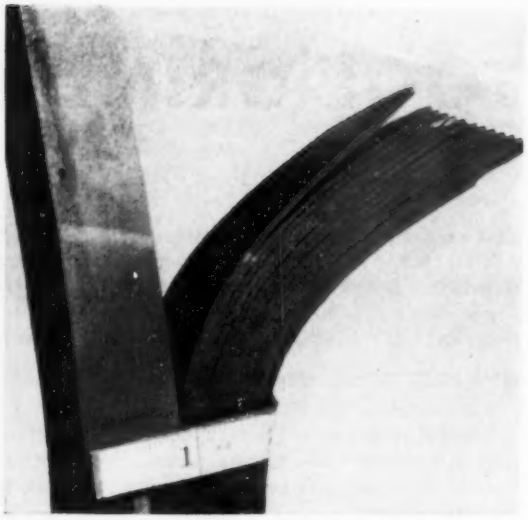
Because Bridgeport-Lycoming is a new division of Avco, there is no prior cost experience to determine savings made with this system. However, it is quite certain that savings are substantial, because the system provides a constant check on tool flow and operator efficiency.



DAMAGED TOOL REPORT is used for all broken or damaged tools, must be filled out before new tool is furnished to replace a broken tool. Colors are pink, yellow, and green



SMALL TAPERED DISK cuts rubber sample into thin slices for testing. Edge of disk runs in coolant pan mounted on lathe. Rubber sample is held between upper and lower spiked clamps as lathe cross feed advances work into cutter



SLICED SAMPLE cut with tapered disk. Sides of slices are parallel within 0.001 in. and cut surface is smooth enough for testing without buffing

TAPERED DISK CUTS HARD RUBBER

BY JAMES K MATTER and FRED W SMITH, Materials Laboratory, DETROIT ARSENAL

All rubber and plastic laboratories face the continual problem of cutting and preparing specimens and samples of rubber, plastisol, and other elastomeric materials for test purposes. Specimens intended for tensile-test machines have to be cut off a block, died out to shape, and buffed to desired thickness. The same procedure is true for specimens intended for compression-set, Flexometer, T-70, and other standard tests.

Sampling on sheets of material fresh from the mills or calendars would be simple. Actual sampling, however, is more complex. For instance, to test the rubber in a solid truck tire or a tank-track block, a suitable piece of the material must be removed, shaped to the desired contour, and fashioned into a specimen of exact thickness with parallel sides. The shape may be round, square, rectangular, or odd-shape, but the main sides must always be parallel.

At present, most rubber samples are prepared by knife cutting, band sawing, die cutting, and buffing to a smooth surface.

Knife cutting—A variety of different shaped knives are used to cut and prepare rubber specimens. The knife is dipped in water, oil, soapsuds, or some other lubricant, and continued strokes are made until the cut is finished. This method has the advantage of utility—the knife can be carried anywhere—and speed.

Disadvantages are that after starting a cut in rubber, it is necessary to keep the edges of the material spread apart to prevent the knife from binding. Frequent lubrication is necessary. Parallel strips are difficult to cut, and, in the thinner sizes, are virtually impossible.

Band sawing—Rubber cannot be cut with the conventional toothed blade as the teeth dig into the rubber and pull it into the kerf, breaking the blade or causing it to run off the pulleys. Blades ground to a knife edge with beveled sides are useful for sawing pneumatic tires into sections, after the metal bead has been cut, but are of little value for sawing blocks of rubber into thin sheets.

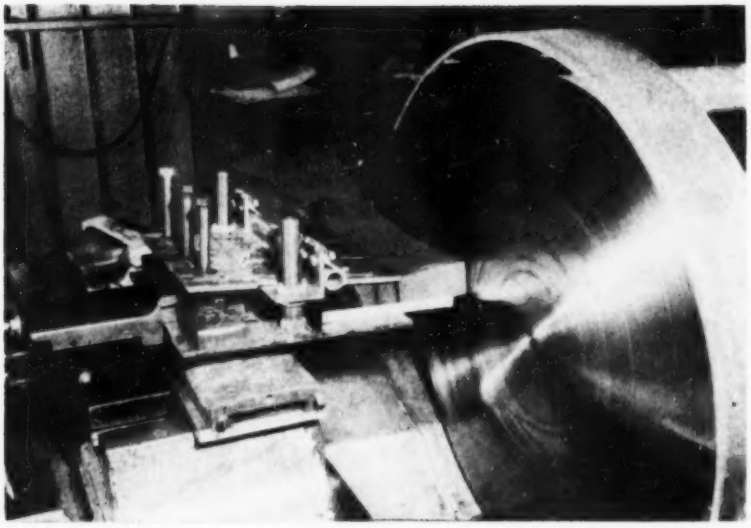
Die cutting—Several types of dies are suitable for preparing samples: hand dies, press dies, and spinning dies. A hand die and maul is the accepted method for cutting rectangular or dumbbell-shaped specimens from flat rubber sheets. When the quantity warrants, power- or foot-operated presses and clicking dies are used. Round specimens over half an inch in height are usually spun out of a block of rubber on a drillpress.

Buffing—Most rubber specimens for testing are buffed to desired thickness, usually to thousandths of an inch. Buffing produces good surfaces and parallel sides. However, it is slow and costly, with the danger of forcing the work, overheating the rubber, and changing the properties to be tested.

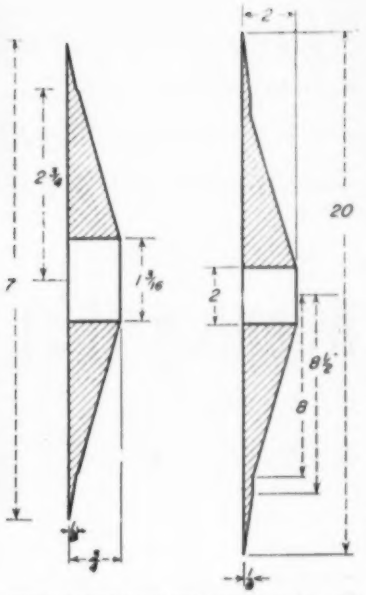
NEW DISK SLICER

A disk slicer for rubber specimens has been developed in the Materials Laboratory of Detroit Arsenal to produce parallel strips and blocks that will not need buffing after cutting.

A circular steel cutter, tapered



LARGE TAPERED DISK cuts samples from block clamped between flat plates. Upper clamp is in three sections, each clamping separately. Sectional clamp adapts to irregular surface on rubber block and is less likely to twist sample



HIGH-CARBON TOOL STEEL is material for disk cutters, which are pressed on shafts and turned in lathes in which used. Cutters must be sharp, but not feather-edged

Uniform specimens for test can be accurately cut from sample blocks by several methods, here compared. There's also a new one, based on a lathe

on one side, is mounted in the headstock of a lathe. The pan under the disk is filled with water or lubricating oil through which the disk travels.

The rubber block is mounted in the holder on the compound rest, and the carriage is moved by hand to the starting position where it is locked in place on the ways. The lathe is started and cross-feed clutch engaged. The carriage moves across the bed and cutter removes a thin slice to square the end of the block. Then the slide on the compound rest is advanced the thickness of the specimen required and a second cut is made, removing the first specimen. The slide is again fed forward the desired amount and the second specimen cut.

This method is fast and produces sides parallel within less than 0.001 in. The oil-lubricated cut surfaces are smooth and even, eliminating buffing. The cutter travels continually in lubricant, reducing heat build-up.

The straight side of the disk parallels the block of rubber while the tapered side forces the cut strip outward, preventing binding. After the carriage is adjusted and the feed engaged, the cut is automatic. Thick or thin slices can be cut from blocks of any required shape that can be clamped.

Cutters are made of high-carbon tool steel, drawn to a blue color. They are sharp, but a feather edge is not necessary or desirable for it doesn't stand up under severe service conditions.

No particular merit is claimed for the mechanical details of the clamps. The cutters represent considerable development work and have proved successful. The clamps are crude affairs, made of available materials, and are open for improvement.

The clamps hold the block overhung in front of the cutter. This is not an ideal condition. Attempts have been made to support the block with a movable plate, but when the plate is moved the width of the next strip cut is not uniform with the width or thickness of the preceding strips. The authors hope that an interested reader can find a solution to this problem.

Sides of the blocks to be gripped should be reasonably parallel, avoiding any twist in the block when it is clamped. Overhang must be restricted or the revolving blade will deflect the block and cut distorted slices.

Best results have been with a block several inches longer than the specimens required. Strips are not cut completely off the block until all the cuts have been made. The block is then removed from the holder and they are cut off individually with a knife.

For the 20-in. disk, a peripheral speed of about 500 fpm with a feed of 0.013 ipr has given the best results. For the 7-in. disk, a lower peripheral speed, 350 fpm, and a 0.007-ipr feed are best.

The first and second cuts should be made carefully, checking for thickness, uniformity, surface irregularities, waviness, and general appearance. Spindle speed and feed are adjusted to obtain the best surface condition and closest tolerances. Finished strips are washed thoroughly in cold water.

"I had the shock of my life the other day," the machine-shop owner was saying. "My assistant told me he was leaving, and I tried to find someone to take his place. Five people were brought in before I gave up and realized it was extremely difficult to find anyone these days. I knew then I was going to have to do something about . . .

Keeping that well-trained assistant...

By ERNEST W FAIR

". . . and do it quick. I should have acted long ago," he concluded, thoughtfully.

His solution was to raise the man's salary and offer him a yearly bonus based on continued good business. The man stayed, but a lot of needless trouble and embarrassment would have been avoided if the shop owner had planned ahead.

Any reader who believes it will be easy to find a well-trained assistant in the open market today has only to look around. It won't take long to find out how few adequately-trained men there are who have the necessary personality traits, including a willingness to work. So we have to take preventive steps to avoid a difficult replacement problem one of these days.

We've checked several score situations to see what employers have done to keep trained assistants satisfied with their working conditions. Here are the most common answers:

ASSURE GOOD LIVING STANDARDS

Nothing has an intelligent and versatile young man looking for another job quicker than finding himself with living standards below others in his community. An employer is dollars ahead paying the best wages his firm can afford. The extra cost is considerably less than the expense of finding and training replacements.

Also, it's hard to believe there's a big future in a place where there has been little or no proof of its possibilities in the past. A person has more faith in the future and more interest in his job when pay raises, even if they are small, come without asking for them, rather than if more money is grudgingly given, and then only after many requests.

Besides money, there are other ways to help your assistant improve his relative standard of living. These include such aids as help in finding better housing, and helping him meet interesting personal friends.

MAKE HIS JOB PLEASANT

It's too easy to forget how important variety is to job contentment. Far too many good men spend their time cooped up in tiny cubby-holes with monotonous work hour after hour. To help relieve this situation, you might plan an occasional change of surroundings—a few minutes a day spent at some other work; even a fifteen minute coffee break will help.

The job of everyone on your staff needs some regular examining. Some little sources of discontent will often be shown up by such a check.. Sometimes it even pays to have some outside friend come in and give the place a thorough, frank analysis. No matter how sincere we are in looking for these unpleasantries, we cannot help but miss some of them.

A good man has ambition; without it he is seldom of much value to his employer. If your assistant can't see anything ahead of him except doing more of what he is doing now, you can't blame him for being discouraged.

SHOW HIM A FUTURE

Show the people on your staff the future possibilities of their work: what things are before them; what industry trends seem to offer. Because of your position, you can usually see these things better than they can.

It's a natural human trait to stay where we feel we are needed. It's just as natural for us to want to leave when no one cares whether we stay or not, where there is a complete lack of personal feeling.

BUILD PERSONAL ATTACHMENT

A little flattery here and there, a sincere expression of appreciation for any work, however small, done outside regular duties, a moment spent exchanging small talk or asking members of the staff their opinion on something of importance—these are all steps to show our staff that we value them above the level of mere tools with which we make money.

All of the above measures can help us know we are making the assistant's job as attractive and interesting as possible. Other ideas will doubtless occur to you if you keep in mind that your assistant's lot must be a happy one.

mist COOLING

L. A. ROSHEER, ASSOCIATE EDITOR

MIST COOLING is the spraying of a cloud of compressed air and atomized fluid to cool a metalworking operation. Mist has long been an effective coolant in a few special operations, such as routing of aluminum sheet for aircraft, but widespread testing of spray systems is a fairly recent development.

Performance of mist coolants has been surprisingly good, replacing conventional flood cooling in many, though not all, jobs where it has been tried.

Results include increased tool life, reduced heat distortion of workpieces, and improved working conditions.

This special report is a summary of results in many metalworking plants, including:

ALLISON DIV, GENERAL MOTORS CORP
CATERPILLAR TRACTOR CO
DODGE MFG CORP
STUDEBAKER CORP

. . . and describes:

- general conditions for spray cooling
- details of various systems
- what coolants are effective
- theory of mist cooling
- case studies of mist cooling on various machines:

  lathes
  milling machines
  high-speed sawing
  grinding
  drilling and tapping

American Machinist SPECIAL REPORT NO. 344 TO THE METALWORKING INDUSTRIES

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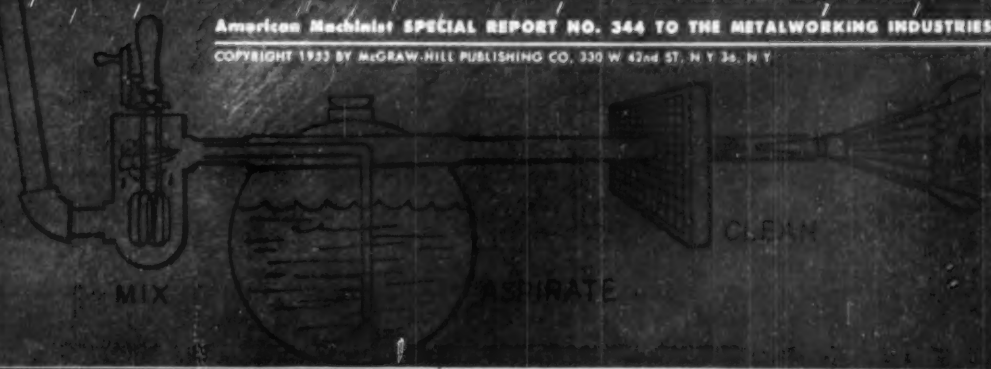
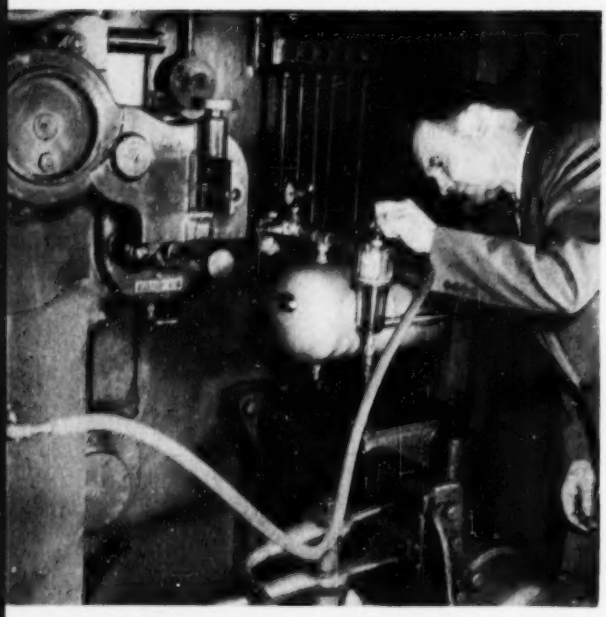
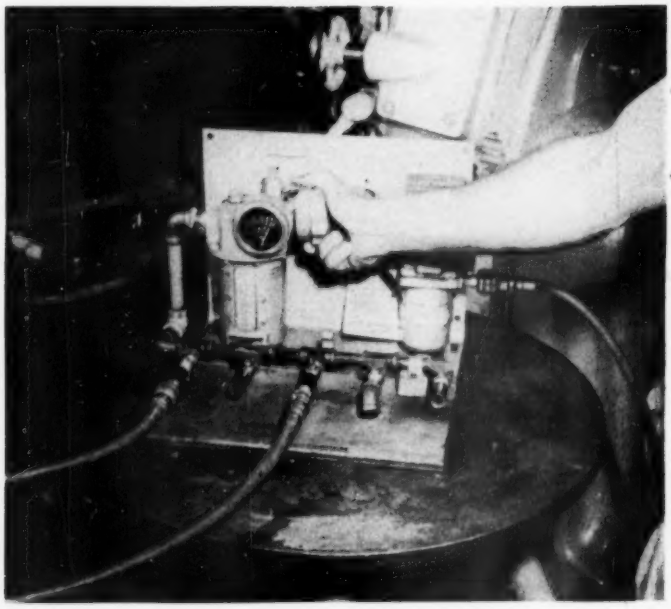


general conditions for spray cooling:



DODGE MFG CORP CONNECTS LO-JET INJECTORS to sidehead rams of Bullard 24-, 42- and 54-in. VTLs through ⅜-in.-ID flexible hose and valves. An 18-to-1 water-base solution with added rust inhibitor is sprayed at approx 40 psi to cool tools machining semi-steel sheaves. Tool life is increased about 35% over dry machining



PORTABLE OIL-MIST INJECTOR devised by Allison's Aircraft Engines Operation plant has manifold so up to five ⅜-in.-ID synthetic-rubber flexible hose lines can be connected with quick-acting couplings. Unit permits running tests on as many as five machines simultaneously if desired. Hoses up to 25 ft long have been used

Recent trial installations of coolant systems spray streams of compressed air and vaporized cutting fluids between tools and workpieces near the cutting surface.

In a number of cases, spray systems have replaced flood systems and splash guards on turret, automatic, engine, and right-angle lathes, side-head boring mills and vertical turret lathes, milling machines, high-speed saws, and, in at least one instance, drillpresses for operations on armor plate. This has eliminated the cost of frequent cleaning of machine sumps, repairs to coolant pumps, and reclamation of cutting fluids from chips.

Machine operators like the spray systems, too, because their machines are easier to keep clean, their clothing and workplaces are not continuously wet with splashing coolant, they do not have to move heavy splash guards aside between machining cycles, and they do not have to change tools so often.

Spray systems have not yet been found suitable for use on some types of machines, nor when cuts are heavy or a number of tools are cutting simultaneously and considerable heat is generated.

Also, it is generally agreed that their use should not be attempted where a heavy flow of liquid is needed to flush chips from cutting areas, as in deep-hole drilling with gun drills and boring heads.

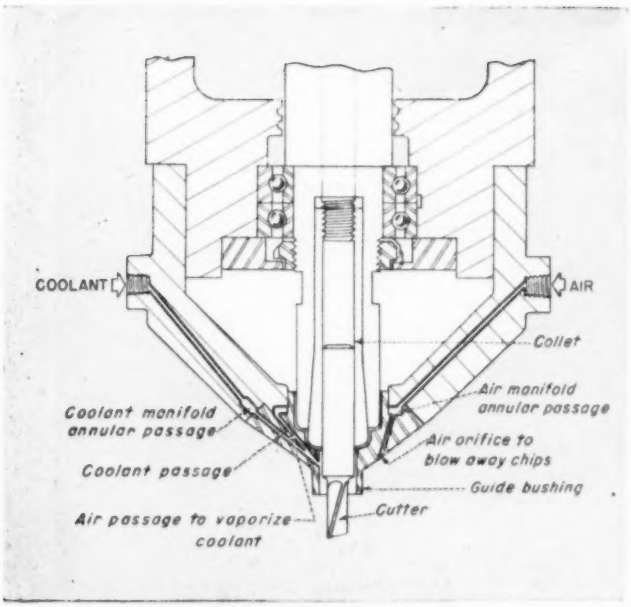
Some operations requiring heavy cuts or deep holes may in the future be improved by combining flood and spray systems. Tool life, in such cases, might be improved with spray nozzles at the cutting tools, while cooling liquid is flooded over the workpiece to remove heat and/or wash away chips. In such cases, the cooling fluid would not require lubricating ability, and might be only water with a rust inhibitor.

As should be expected, spray systems have proven effective for operations commonly performed dry, such as carbide face-milling of aluminum, cast iron, and steel parts, and boring-mill cutting of semi-steel sheaves and pulleys. A spray system is also reported to have made possible the face-milling of a large titanium part for an aircraft engine, after flood cooling with various cutting fluids had failed to protect the cutter for even one complete cut.

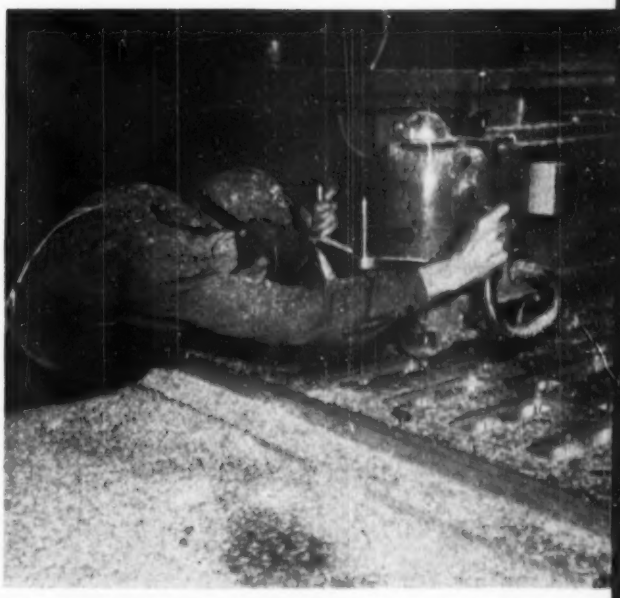
TYPICAL SUCCESSES

Spray cooling has also been tried with varying success for drilling, reaming, and tapping. It has, in a few cases, kept reamers so cool they cut undersize, and has kept at room temperature taps that previously heated rapidly and cut oversize. But it is not very effective when cooling conventional twist drills in holes deeper than two or three diameters.

However, spray systems seem to be especially effective with oil-tube twist drills, even when drilling hard-to-cut materials like armor plate and titanium. In one test, several ½-in.-dia holes were drilled easily in a titanium bar with a 20-to-1 vaporized water solution of Acro-Coolant fed



THIS 5-HP, 15,000-RPM ROUTER HEAD developed by Ekstrom, Carlson & Co for cutting aluminum alloys at high speeds has air and cutting-fluid passages drilled radially around guide bushing and its support, so 20-psi cooling and lubricating spray is delivered all around revolving cutter. Air from orifices blows away chips. Richer water-base solutions are used for heavy cuts



FIRST PRODUCTION USE OF SPRAYED CUTTING FLUID for metal-cutting operation was probably the cooling and lubrication of router bits used by aircraft plants to cut aluminum sheets to templet shape. Guide-bushing support is usually drilled for air and fluid passages, so spray is directed down along rapidly revolving cutter

Courtesy Ekstrom, Carlson & Co

through the tubes of the drill at 100 psi from a Lo-Jet injector. At this pressure, chips were effectively blown from the hole as it was drilled, and the drill tip remained close to room temperature.

Air-stream cooling of cutting and grinding operations is not new, as has been noted by Prof Ing G Pahlitzsch in a recent report discussing gases as cutting coolants (AM—Feb 16 '53, p196). In fact, more than 20 years ago, a major supplier of carbide-tipped cutting tools ran successful tests of cooling diamond-wheel grinding operations with air jets, with setups similar to those employed for CO_2 cooling of carbide tool grinding at Cadillac's tank plant in Cleveland (AM—Feb 16 '53, p172). Cost of compressed air, compared with soluble coolants, caused abandonment of the method at that time.

For a number of years aircraft manufacturers have used a spray system for cooling and lubricating routing cutters when milling the edges of aluminum-alloy sheets to templet shape. Usually these operations vaporize cutting oil or coolant into a high-pressure air stream, so the chips are blown away from the cutting area.

AN OCCASIONAL FAILURE

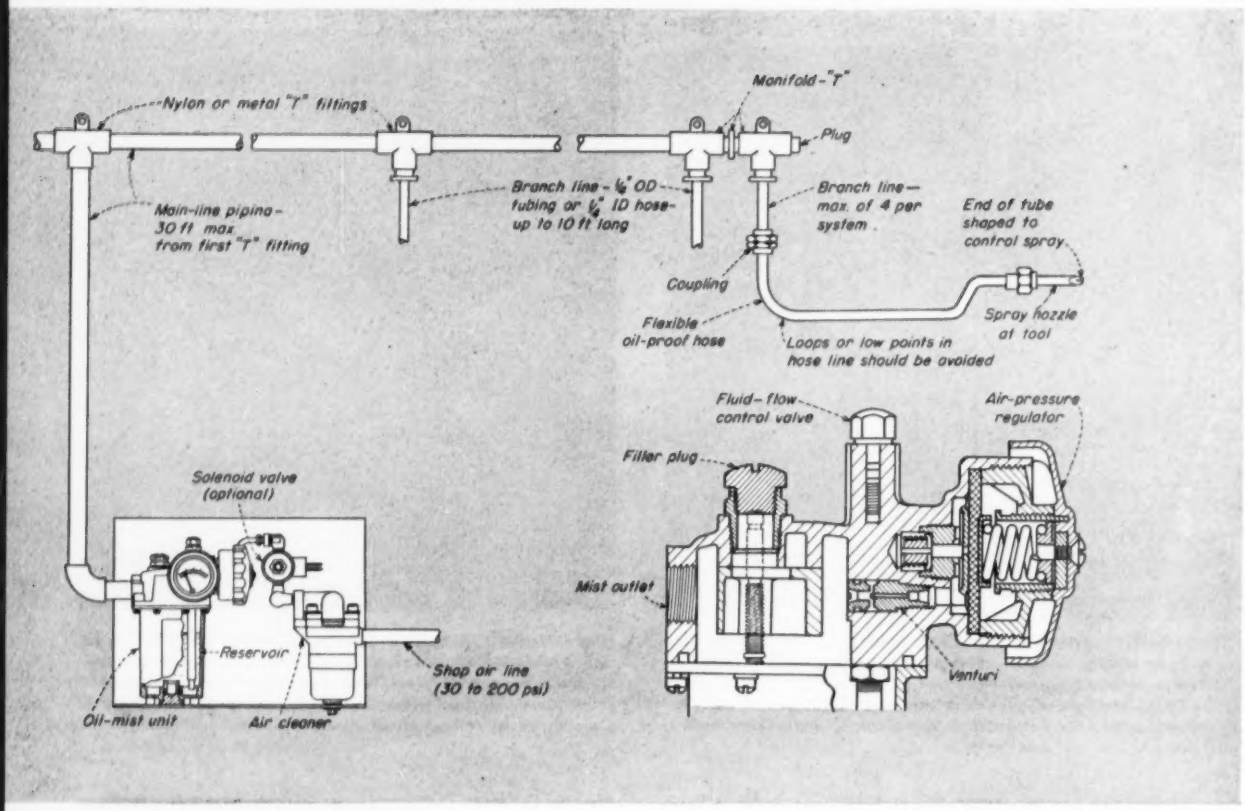
A principal disadvantage of air and gas jet cooling, as noted by Prof Pahlitzsch, is the danger of blowing chips and abrasive particles into slideways, bearings, and spindles.

This was proven recently in a midwestern plant, where a large 2-spindle precision boring machine had been tooled for spray cooling of boring bits. Tests had shown that tool life would be increased, and tapered holes, caused by wear of the cutters, would be eliminated. The desired results were achieved—in fact, tool life was boosted to four times that experienced when boring dry—but chips blown against work locators caused misalignment of the sleeves unless the locators were cleaned carefully each time new parts were loaded. Operation cost was increased more than was saved by increased tool life, so the spray system was removed.

This was the only such case reported during a recent survey of some of midwestern plants testing spray cooling systems. Most spray pressures are too low to cause chips to scatter far, even if the chip produced is so small that it can be moved by the air-stream. Also, in most cases, direction of the spray can be adjusted so that small particles will be directed away from areas where they will cause damage.

Flood cooling of carbide tools may be the cause of rapid tip breakage, as has been suggested by Leo J St Clair (AM—July 20 '53, p125). When the cut is uneven or curling chips interfere with delivery of the cutting fluid to the tip of the tool, the tip is alternately doused and heated, and is subject to considerable thermal shock. Undoubtedly, this shock causes tiny cracks which gradually enlarge and lead to tip failure.

details of various systems:


Nylon or metal "T" fittings
Manifold-"T"
Plug
Main-line piping-30 ft max from first "T" fitting
Branch line-¼" OD tubing or ¼" ID hose-up to 10 ft long
Branch line—max. of 4 per system
End of tube shaped to control spray
Coupling
Flexible oil-proof hose
Spray nozzle at tool
Loops or low points in hose line should be avoided
Fluid-flow control valve
Air-pressure regulator
Filler plug
Solenoid valve (optional)
Mist outlet
Reservoir
Shop air line (30 to 200 psi)
Venturi
Oil-mist unit
Air cleaner

ALEMITE OIL-MIST

Several types of injectors, including two simple, homemade experimental units, were noted during the survey. The Alemite Oil-Mist lubricator was originally developed to vaporize lubricating oils into minute particles and suspend these particles as a finely divided mist in a stream of compressed air for delivery as a lubricant. The mist is carried through ½-in.-OD, 0.025-in.-wall tubing or standard ⅜-in. pipelines for distances up to 30 ft from the unit, then through ¼-in. ID or larger tubing or flexible-hose branch lines.

At the point of discharge, the saturated air stream can be exhausted as a mist or fine spray, depending on the diameter of the orifice and the velocity of flow. The effectiveness of spray orifices depends on the maintenance of minimum pressure drop through the lines of the delivery system. As line pressure drops, the quantity of air which flows from the fittings, and the efficiency of conversion, from mist to fluid oil, drops almost in direct proportion. If a wetter spray is required for a given application, the pressure in the system must be increased. Alemite engineers recommend that the standard Oil-Mist No. 380435-A spray fitting, which has an 0.067-in. bore, be used wherever possible, and that larger spray orifices be avoided.

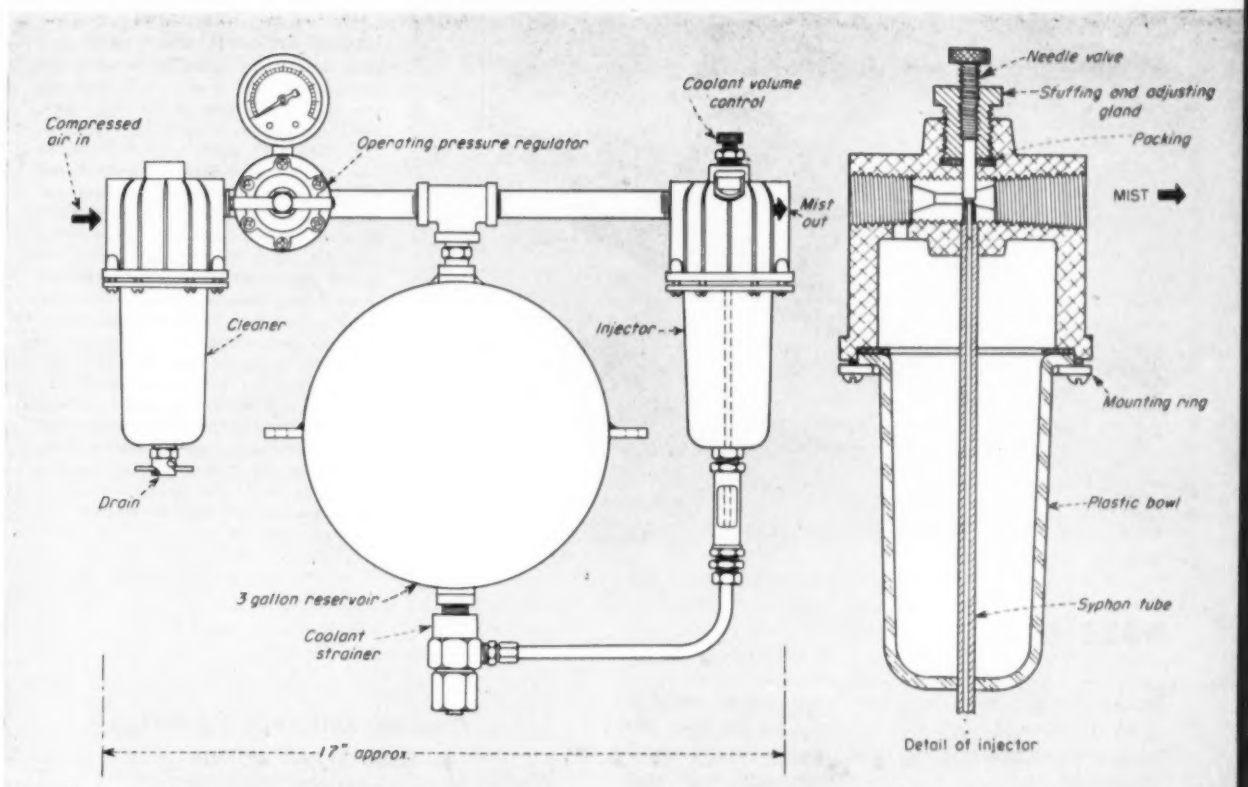
The 0.067-in.-bore spray fitting is roughly equivalent, in condensing capacity, to a 1¼-in. length of ⅛-in.-OD, 0.061-in.-ID steel or copper tubing, and to about 3 ft of 3/16-in.-OD, 0.123-in.-ID tubing.

Since line pressure drops rapidly as number or size of orifices is increased, the number that can be used in a given Oil-Mist system is limited. No more than four of these fittings, or orifices of equivalent capacity, should be used in one Oil-Mist spray cooling system.

An accompanying table (see following page) lists oil-delivery rates and air consumption for Oil-Mist spray systems with one and four of these 0.067-in.-ID fittings at various air pressures.

The following table compares delivery rates of the Oil-Mist unit with oils of various viscosities. Tests were run with the lubricator operating at 75 F, with the pressure regulator at 20 psi, with oil-feed control valve fully open:

Viscosity (100 F)	Oil Output, oz per hr
55	0.70
110	0.60
300	0.45
500	0.40
800	0.35
900	0.20



ACRO LO-JET

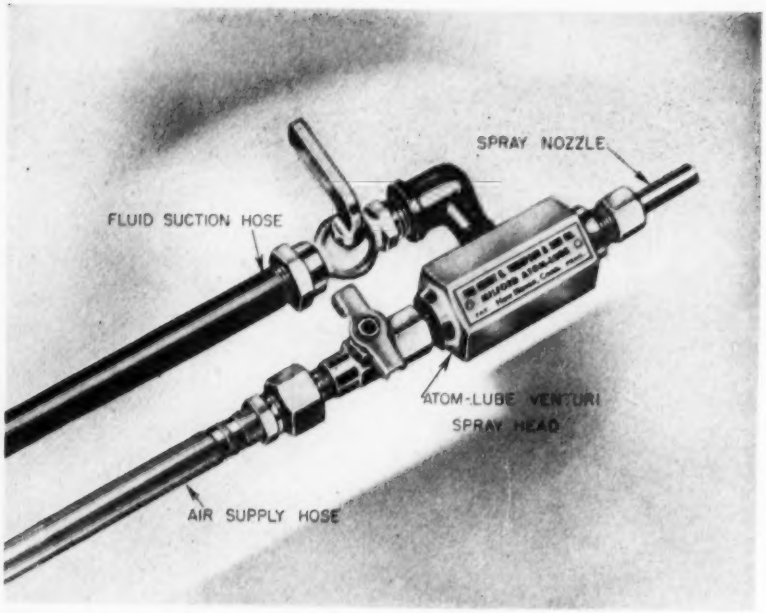
As far as can be determined, the first practical application of a cutting-fluid spray system to a single-point tool was made some 18 months ago by H J Goodyer, chief engineer of Air Conversion Research Corp. His installation, with standard Acro airline units—air cleaner, pressure regulator, and lubricator — fed an airstream through tubing and flexible hose to a small (⅛-in.-OD tube) orifice, injecting a steady flow of vaporized cutting fluid into the airstream.

The Goodyer Lo-Jet injector, originally designed as a lubricator, incorporates the original combination of elements, modified to suit the requirements of a coolant system. A fluid supply tank connected to the airline and lubricator provides added reservoir capacity. Central systems are now being developed with large, automatically filled reservoirs that can feed cutting fluid to a number of injectors.

The Lo-Jet system also includes centrifugal distributor heads to insure equalized feeding to all orifices in a multi-nozzle installation. Also, venturi fittings have been developed for Lo-Jet systems where long main or branch lines would lead to excessive condensation of fluid ahead of the nozzles, causing erratic flow and sputtering at the orifices. These fittings provide for continuous suction pickup and revaporization of accumulated condensate into the coolant stream.

Operating pressure of the Lo-Jet injector can be adjusted from 1 psi to full airline (80 to 100 psi, normally). Normal operating range is 40 to 80 psi, depending on metal being cut, type of cut, and length of main and branch lines. Slight variation in injector pressure apparently has no appreciable effect on cooling action. However, both volume of air and quantity of fluid delivered to the spray nozzle vary almost directly with air pressure at the injector. So, in general, when cuts are heavy and faster cooling is necessary, higher pressures are required.

When feeding a water-based solution with a standard Lo-Jet injector to a 0.062-in.-ID orifice spray nozzle, and obtaining an average spray, the injector will vaporize approximately 6 oz of fluid per hour at 40 psi. This feed rate will increase to approximately 12½ oz per hour if air pressure is increased to 80 psi, all other conditions remaining the same. Lo-Jet injectors are made in five types, each with different max and min fluid and air-volume discharge rates. The manufacturer of Lo-Jet injectors does not advocate their use with straight cutting oils.



MILFORD ATOM-LUBE SPRAY HEAD is a small venturi-tube assembly to which are connected up to 4 ft of ¼-in.-ID fluid suction hose, a connection to the shop airline, and a spray nozzle of up to 12 in. of ⅛-in.-OD, 0.061-in.-ID metal tube that can be bent as required to direct the spray toward the cutting area. The Atom-Lube head can be positioned to any required angle. When drawing cutting fluid from an elevated container, 30 to 35 psi air pressure is required. Approx 60 psi or more is required when cutting fluid is drawn from a container on the floor below the spray head. Average consumption of compressed air at 90 psi ranges between 1½ and 3 cfm. Cutting fluid can be changed quickly, by simply moving the fluid-suction hose from one container to another. This unit has been applied effectively to sawing, surface grinding, milling, and drilling. Coolants ranging from plain water with a rust inhibitor to heavy machine oils may be applied with the Atom-Lube unit

nozzles:

Spray cooling systems now being tested require spray nozzles at each cutting tool, an injector for mixing vaporized cutting fluid into the compressed air stream as it is fed to the nozzles, and tube and flexible hose lines for connecting the nozzles with the injector. Flexible hose permits traversing the tool through its cutting path without complicated flexible joints in tube lines, and makes possible quick-acting airline couplings so turret-mounted tools can be connected to the system only when actually cutting. This minimizes the need for complicated plumbing on multi-tooled machines where only a few of the tools function at any one time.

Nozzles for single-point tools are generally short lengths of ⅛-in.-OD copper or steel tubing, supported with compression couplings or clamps, so their orifices are approximately 1¼ to 1½ in. from the point of contact between the tool and the work.

These tubes are easily bent for proper direction of the air stream. In fact, copper nozzle tubes are so easily bent that they are sometimes deflected by chips or other causes, and the operator has to readjust them from time to time. Often the substitution of a steel tube eliminates this trouble.

However, Dodge Mfg Corp now drills a hole through the heel of the tool at approx 32° from vertical, so coolant spray comes out through the clearance face immediately below the carbide tip. The copper nozzle tube is then slipped into the lower opening of this passage, and makes possible entry of the spray without exposing the nozzle to damage or deflection. Dodge has made a special drill jig to insure that hole location will match the position of the nozzle on the toolblock.

DELIVERY RATES FOR OIL-MIST FLUID SPRAY SYSTEM

USING 0.067-in.-BORE SPRAY FITTINGS

Operating Pressure At Oil-Mist Unit (Lb per Sq In)	One Fitting in System		Four Fittings in System	
	Oil Output Per Fitting (Oz per Hr)	Air Consumption (Cu Ft per Min)	Oil Output Per Fitting (Oz per Hr)	Air Consumption (Cu Ft per Min)
10	0.052	1.0	0.033	1.35
20	0.487	1.5	0.059	1.75
30	0.610	1.85	0.085	2.20
40	0.735	2.3	0.120	2.70
50	0.855	2.8	0.159	3.10

This table is based on tests made with somewhat heavier oil (500 sec Saybolt at 100° F) than the light mineral oils (approx 300 to 400 sec Saybolt at 100° F) and water-base solutions that usually would be employed in spray coolant systems, and readings were taken with the oil-feed control valve on the Oil-Mist unit full open. Delivery rates per fitting when using lower-viscosity fluids will be found to be somewhat higher than the values given above. The Oil-Mist unit will effectively vaporize oils up to approx 1,000 sec Saybolt at 100 F, including extreme pressure oils within this range. Compounded oils containing graphite, soaps, fillers, or any other solids cannot be used.

coolants:

Cutting fluids being tested at present range from specially compounded water-soluble bases to conventional soluble oils and light mineral oils.

Among the specially compounded bases are Acro-Coolant, said to be a high-molecular-weight chlorinated hydrocarbon; and some of the Metalloid bases. Most bases are mixed with water, in ratios of 1 part base to from 12 to 50 parts water; at higher dilutions, rust inhibitors should generally be added, particularly when machining cast iron and semi-steel. For better finishes, wax emulsions may be added to the bases.

No one contacted has been testing spray cooling long enough to complete tests to show which cutting fluids are best for different cutting conditions on different materials; at what pressures the airstreams should be fed to spray nozzles; or what type and size of orifice should be used for different conditions. Results reported in accompanying text and illustrations are merely examples of what has been done to date in the plants studied.

At Studebaker's aircraft engine parts plant in Chicago, where a large number of spray systems have been installed, a number of comparison tests have been run with various bases in Lo-Jet spray systems in a variety of machine tools. Some bases were eliminated quickly, because of odor or toxic effects when vaporized. With some bases, best cooling effects are obtained when the base is diluted with nontoxic isopropyl alcohol, one part alcohol to 4 parts base, before mixing the base with water. Tests indicate that bases with a high evaporation index are desirable.

It has been noted that 410 stainless and Timken 16-25-6 alloys machined in some of the spray-cooled operations at the Studebaker plant remain close to room temperature, even under relatively heavy cuts, and chips removed with carbide tools at somewhat higher than normal speeds and feeds are not discolored. Light sections are not distorted by heat.

On the other hand, equally successful applications of spray systems in one of the transmission plants of Allison Div, General Motors Corp, run hotter, and chips show a blue discoloration, even when machining lower alloy steels. Allison uses thinner solutions (generally about 40 to 1, compared with 24 to 1 of Studebaker), which may have some bearing on the results. Also, Allison is still experimenting with several bases, without alcohol additives, in order to determine the most desirable base characteristics.

At Dodge Mfg Corp, where Lo-Jet spray systems have been mounted on a number of Bullard VTL's tooled for machining large cast semi-steel (60% iron, 40% steel) V-belt sheaves, little difference has been noted in various bases. After a number of tests, Dodge has decided on an 18-to-1 solution of either Acro-Coolant or the base normally used to make up emulsions for machines with flood-cooling systems, with rust inhibitor added to protect the parts. Conventional carbide tooling is used, and average tool life is 35% higher than when operations were performed dry.

theory of cooling action:

According to H J Goodyer, of Air Conversion Research, the cooling and lubricating action of spray systems can be explained as follows:

1. Rapid expansion of the air as it passes through the nozzle orifice at relatively high velocity causes a reduction in air temperature. Tests indicate that the temperature of the airstream 3 in. away from the orifice of a Lo-Jet system spraying a 24-to-1 water solution of Acro-Coolant ranges from 48 F to 52 F, when room temperature is 70 F, the controlling factor being the temperature of compressed air fed to the injector.

2. Evaporation of the volatile constituents of the cutting fluid, condensed as the airstream passes through the orifice, absorbs heat from the tool, chip, and workpiece.

3. Rapid removal of this hot vapor from the cutting area by the passing airstream insures a high rate of heat transfer from the metal parts to the surrounding atmosphere.

4. Lubrication of the chip at it passes over the tool reduces the rate at which friction heat is generated.

In all of the single-point tool applications surveyed for this report, the nozzles are placed under the heel of the tool, with the spray directed at the wedge-shaped opening between the front clearance of the tool and the surface of the workpiece just traversed by the tool. Lubricating constituents of the cutting fluids, remaining after volatile matter has been exaporated by the heat of the cut, are thrust by the airstream against the underface of the chip, and are probably carried across the top face of the tool by the moving chip. Indications are that this practice is more efficient than that described by Prof Pahlitzsch, because none of the spray is wasted by deflection against the chip.

applications of mist coolants:

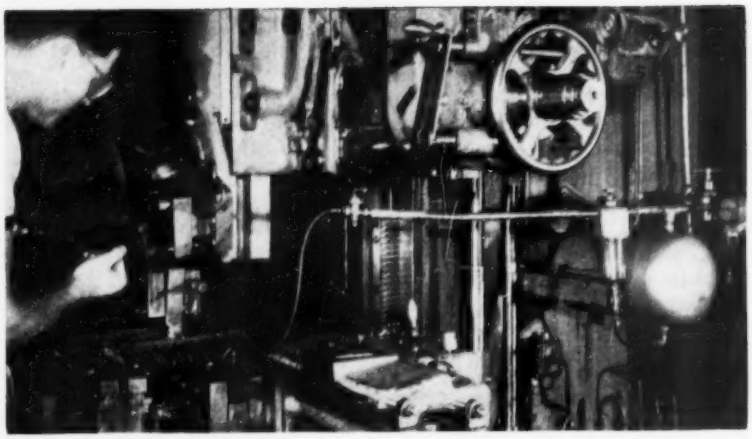
LATHES

Mist cooling of lathe tools is one of the most recent applications of mist cooling. Flood cooling, the more the merrier, has been the keynote. Where mist can be applied, therefore, there is a significant gain in cleanliness, tool life, and working conditions.

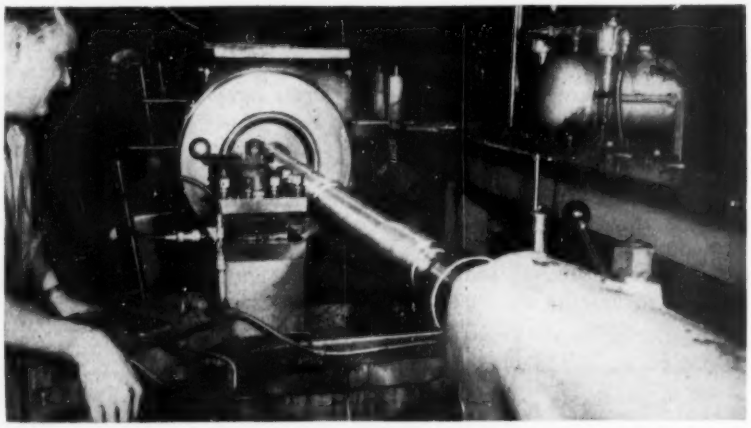
In one successful operation, two ⅛-in.-OD copper-tube nozzles cool the single carbide-tipped tool finishing a 48-in.-ID, 3-in.-deep bore with 48 interruptions, in a stainless-steel turbojet-engine diaphragm assembly. Hardness averages 350 to 360 Brinell, and depth of cut varies from 0.030 to 0.060 in. With flood cooling, three tools were needed to complete one bore. But with two orifices, one in front, the other in back of the tool, spraying undiluted Metalloid X-30 base at approx 35 to 40 psi, one tool now completes the entire cut at 300 sfpm, 0.009 ipr feed. Finish is improved because the tool wear rate has been decreased. Separate ⅜-in.-ID hoses, each approximately 15 ft long, deliver coolant to nozzles on the ram of the 54-in. Bullard VTL used for this job.

Another successful application consists of spray cooling the cutoff and chamfering tool on a No. 3 Warner & Swasey turret lathe finishing the ends of 1-in.-OD AMS 6415 steel tubes (hardness, 26-32 R_c) at 952 rpm, 0.018 ipr feed. With a heavy cutting oil in a conventional flood system, tool life averaged 60 to 70 pieces between grinds. With an Oil-Mist unit spraying undiluted Metalloid X-30 at 30 psi, tool life has been increased to 125 pieces, and finish is materially improved. Coolant is fed through approx 12 ft of ⅜-in.-ID hose.

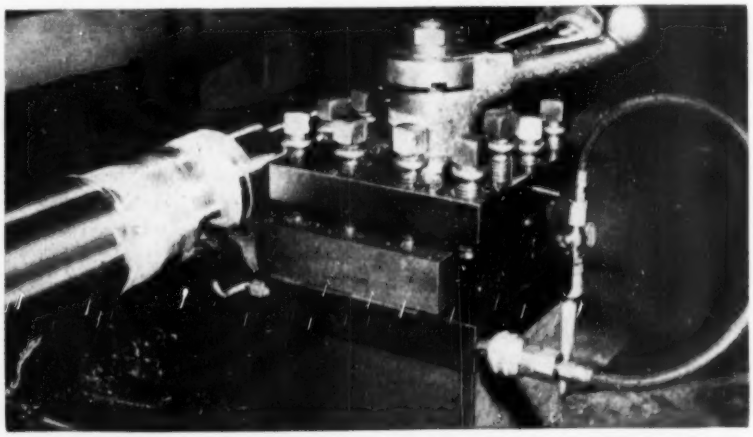
Other successful applications are pictured on this and following pages.



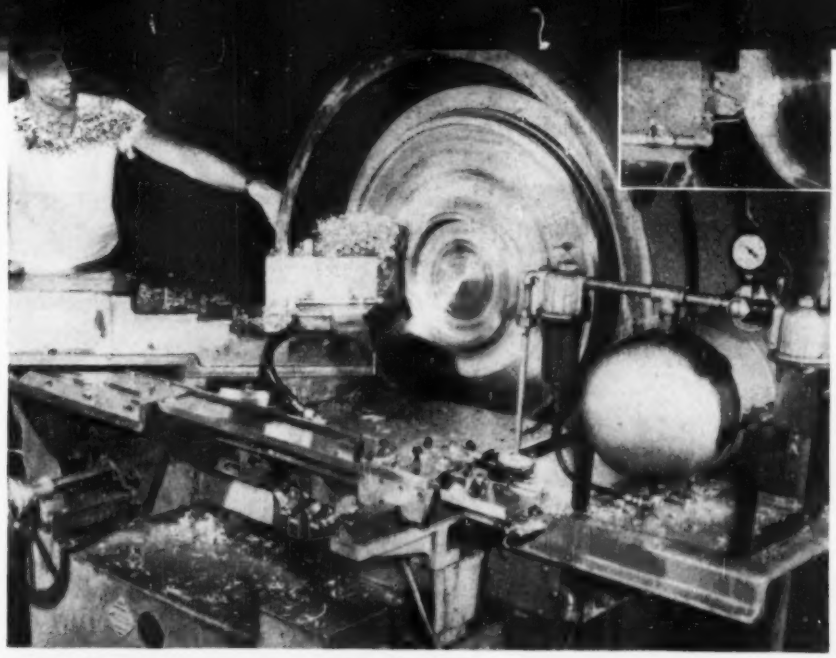
FACING, TURNING, AND BORING a 410 stainless nozzle diaphragm for a J-47 jet engine, at 52 rpm, 0.009 ipr feed. Finish must be 40 mu-in. rms or better. Studebaker's Chicago plant does this job with 24-to-1 water solution of Acro-Coolant, Lo-Jet injector at 75 psi



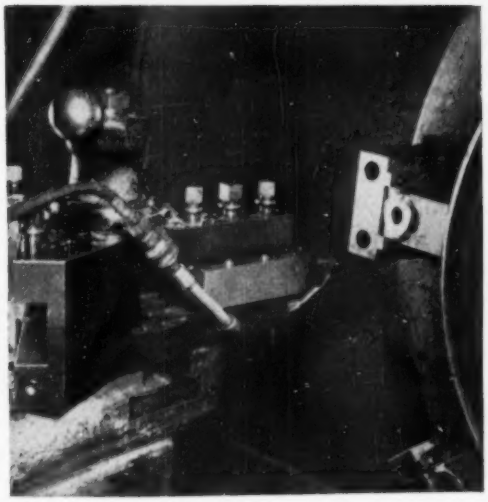
STUDEBAKER ROUGH TURNS forged SAE 4340 jet-turbine shafts (hardness, 285-321 Brinell) in two 3/32-in.-deep passes at 196 rpm, 0.022 ipr feed. Spray nozzle under tool is connected through ¼-in.-ID tubing clipped to cross slide, and ⅜-in-ID hose



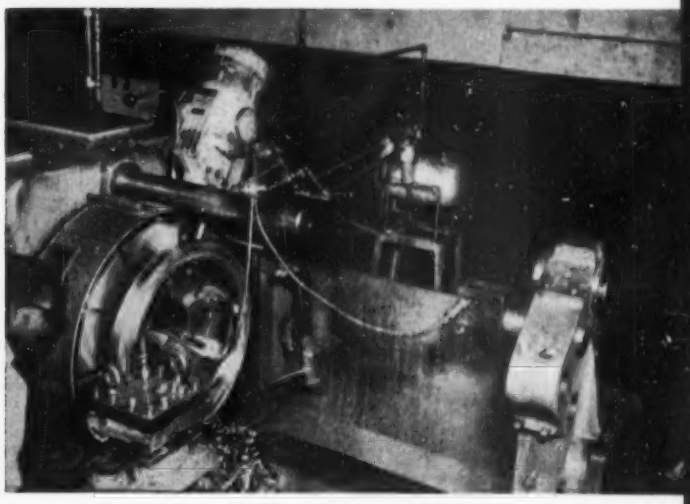
QUICK-ACTING COUPLING connects airstream hose line to 5/16-in. passage drilled through turret base for delivery of coolant-laden air to short ⅜-in.-dia nozzle tube in compression fitting under tool. This Studebaker setup for tracer turning of turbine shafts uses 3 gal of coolant per 8-hr shift; injector operates at 50 psi



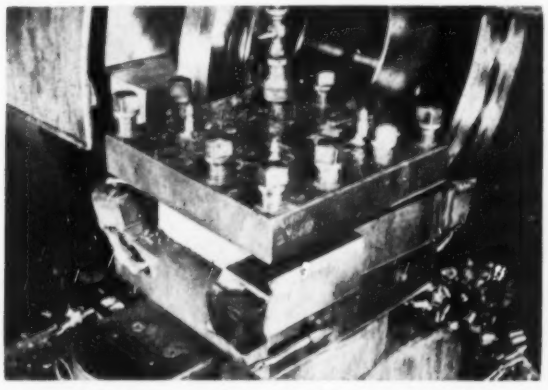
LO-JET SPRAY INJECTOR assembly is mounted on slide of LeBlond Hydratrace T-lathe in the Studebaker plant, contour-facing 25 ¼-in. aluminum alloy compressor wheel for J-47 jet engine. Tool is changed every 13 pieces, whether it needs sharpening or not. Cut is taken at 500 rpm, 0.008 ipr feed. Inset shows nozzle fed through tube clamped to slide, instead of through passage drilled in tool-block. Aluminum chips in this operation are too light to damage tube or nozzle. Injector vaporizes 24-to-1 water solution of Acro-Coolant at 40 to 50 psi



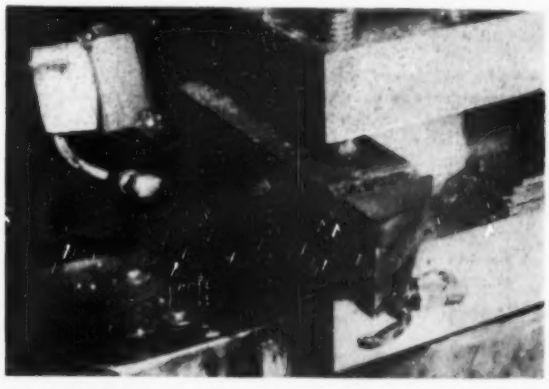
SAE 4340 FORGED COMPRESSOR WHEEL (hardness, 280-300 Brinell) is finish-contoured in Lodge & Shipley T-lathe at 165 rpm, 0.016 ipr feed across face, 0.008 ipr feed in radius, without heat distortion. Lo-Jet injector sprays 24-to-1 water solution of Acro-Coolant at 40 psi. Finish and rough pass taken with each tool



TWO ACRO LUBRICATORS are mounted on Lo-Jet injector feeding coolant-laden air to this 5L Gisholt turret lathe so full spray volume can be fed simultaneously to a tool on carriage and one on turret while finishing Timken 16-25-6 turbine wheel rings in Studebaker plant. Injector operates at 60 psi, uses 6 gal of coolant each 8 hr

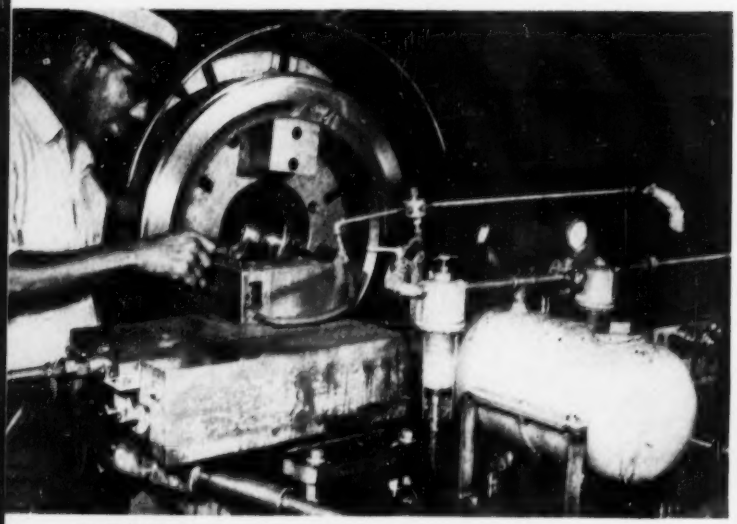


CARRIAGE TURRET on Studebaker's 5L Gisholt turret lathe has ⅛-in.-dia steel tube nozzle under each tool, with 5/16-in.-dia passages drilled in turret to quick-acting coupling connectors on top face. Hose line from injector is moved as turret is indexed

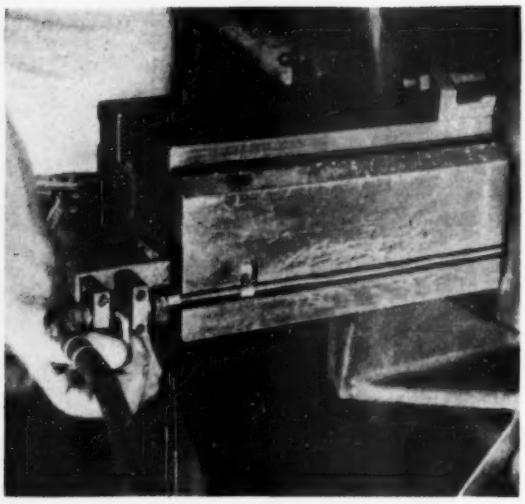


NOZZLE TUBE under carbide-tipped form tool on carriage of Studebaker's 5L Gisholt turret lathe is bent to follow form, plugged in end, and drilled at four places to provide spray across full face of tool. Tool life was more than doubled

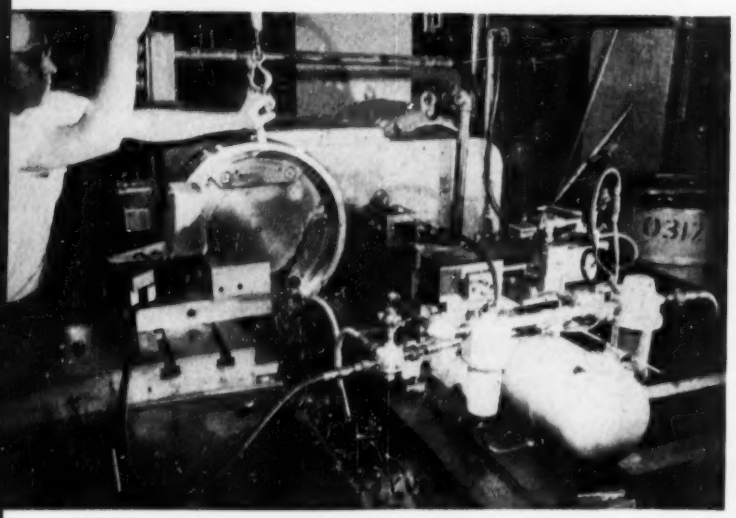
Applications of mist coolants:



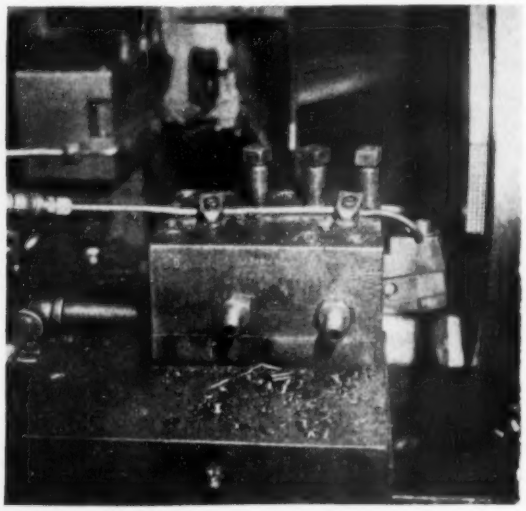
AT STUDEBAKER, on this Gisholt Simplimatic automatic lathe, two carbide tools rough turn and face 28-in. OD Timken 16-25-6 alloy turbine wheel rings (hardness, 269-321 Brinell) at 32 rpm with 0.008 ipr feed. Lo-Jet system feeds vaporized 24-to-1 solution of Acro-Coolant to two spray nozzles at 65 psi—makes possible tool life of 15 to 18 pieces between grinds. Formerly: 1 piece per tool



TO AVOID INTERFERENCE of hose lines with operator's movement when setting tools, Dodge runs 3/16-in.-dia tube along rear of sidehead ram and mounts valve on bracket between two blocks for protection. At other end, fitting connects tube to 5/16-in.-dia hole drilled through ram and tool turret for connection to coolant spray nozzle

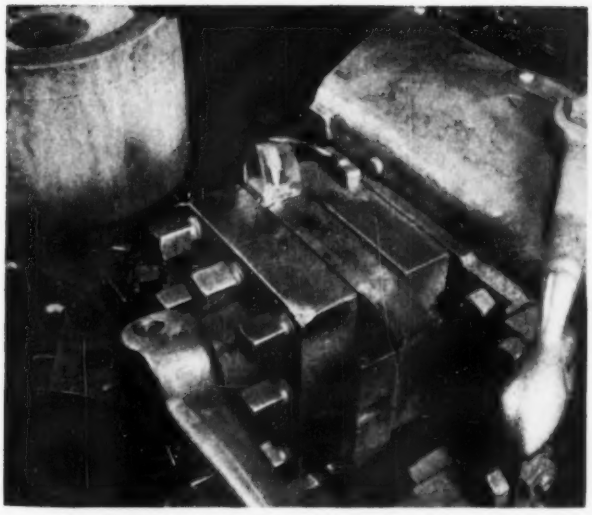


FORGED SAE 8640 TRANSMISSION brake anchor rings are rough turned, bored and faced with 3 carbide inserts in Sundstrand 12A automatic lathe with Lo-Jet injector on table. Airstream carrying vaporized 40-to-1 water solution of Metalloid SOS base is fed to three nozzles through centrifugal distributor and ⅜-in.-ID hose lines

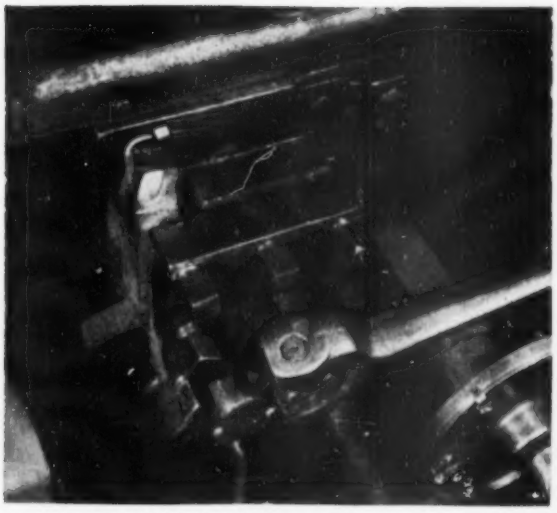


SPRAY NOZZLES on Stundstrand automatic lathe used for roughing operations on Allison transmission brake rings are 10 to 12 in. lengths of ⅛-in. tubing clamped to tool blocks. With flood coolant, tools lasted for 17-18 pieces. Now they are changed after 150 pieces, whether they need sharpening or not. One tool lasted for 350 pieces

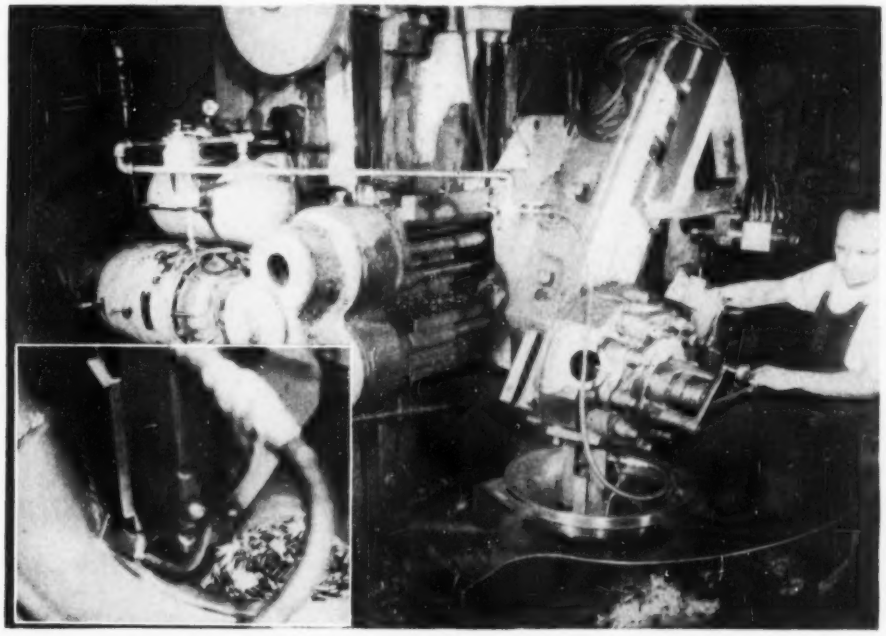
CAST MILD STEEL converter housing is faced and bored at 45° with carbide inserts in this setup on 36-in. Bullard VTL. Job formerly was done with 80-to-1 coolant from flood system — average was 4 to 5 pieces per tool corner. Now, with 40-to-1 mix of water and Metalloid SOS base, rate is approx 10 to 12 pieces per corner. Facing cuts are taken with sidehead tool, boring is done with tool in ram



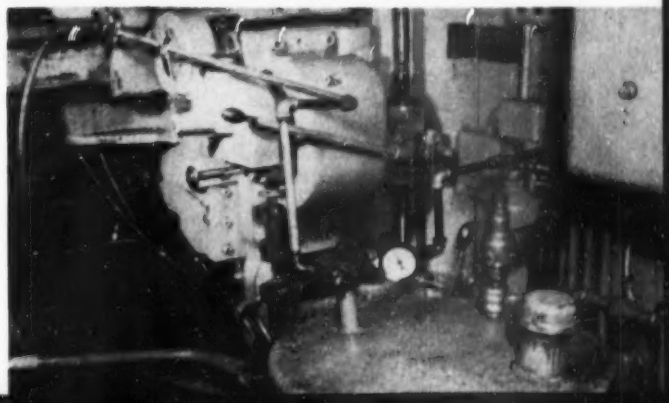
FOUR-POSITION RAM TURRET on VTLs equipped for spray coolant cooling at Dodge plant are drilled with 5/16-in.-dia channels at each corner to bring airstream from hole drilled in ram to nozzle fixed under each tool as it is indexed to cutting position. O-ring seals joint between turret and ram when turret is indexed and locked in position for cut



BECAUSE SPRAY NOZZLE TUBES extending out under heel of tool continually were being damaged or moved out of position, Dodge now drills 3/16-in. spray passage through tool shank and inserts shortened nozzle tube in bottom end. This insures delivery of cooling spray close to where tool contacts workpiece without endangering nozzle

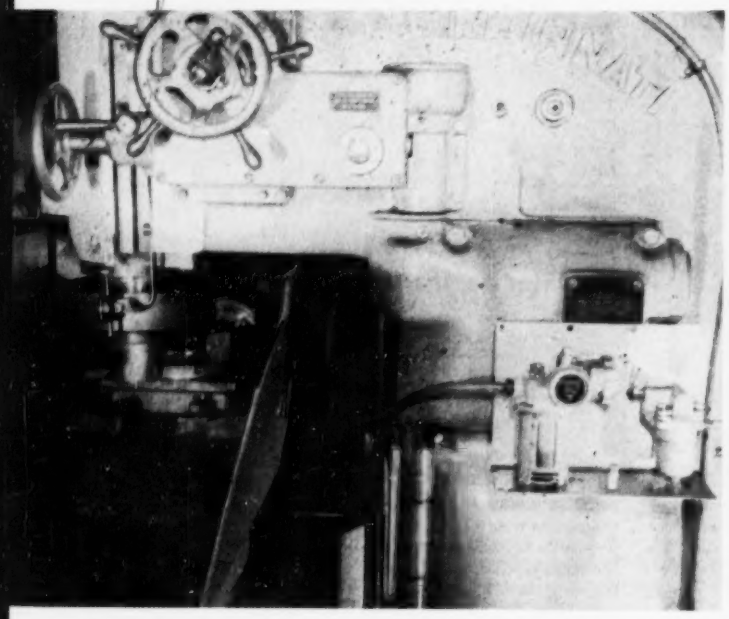


STEEL COVER for Allison hydraulic transmission is contour bored and faced in this 54-in. Bullard VTL equipped with Turchan tracer head and templet. Two carbide tools are used, each in a separate turret position. Lo-Jet injector operates at 85 psi, serves two adjacent machines. Spray system uses 40-to-1 Acro-Coolant mix, more than tripled tool life, doubled production. Spray nozzle on turret block made possible taking full depth of contour facing cut on this 20-in.-OD cover in one pass, increased tool life to 10-12 parts per grind. With flood system, 2 or 3 cuts were necessary, and tools were resharpened every 3 pieces. Nozzle on each tool holder is length of ⅛-in. OD tube supported with clips, has quick-acting coupling so hose can be connected easily

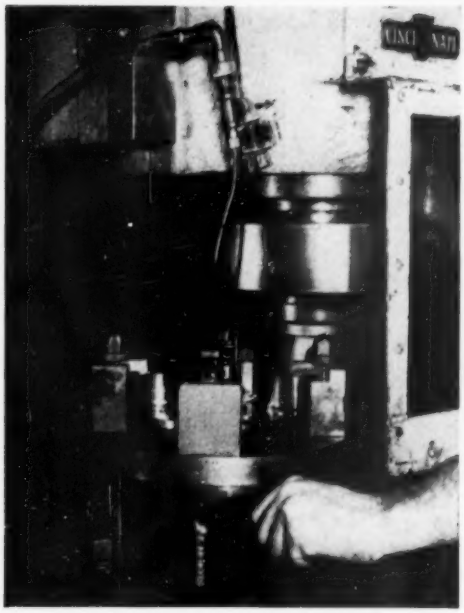


COOLANT is fed from 25-gal tank to spray nozzles on 36-in. Bullard VTL for housing operations with W R Brown airline lubricator and pressure regulator. Operating pressure can range from 40 to 65 psi without apparent change in cutting conditions or tool life. Hose is connected to tool spray nozzles alternately through q-a coupling

applications of mist coolants:



TOOL LIFE and production rate were doubled, and difficulty in producing required surface finish disappeared when Oil-Mist spray cooling system was adapted to this No. 4 Cincinnati vertical miller roughing and finishing four pockets in a forged SAE 4340 Allison transmission part. Coolant is undiluted Metalloid X-30 base



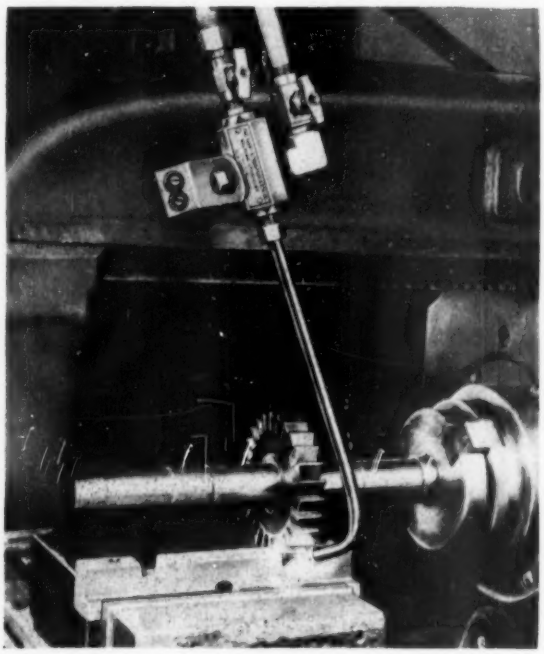
APPROX 18-IN. of ⅛-in.-ID copper tubing, bent around 12-in.-OD 3-in.-face flywheel, and 3⅝-in.-OD carbide face-mill on No. 4 Cincinnati vertical mill for machining forged Allison transmission part. Cutting fluid is vaporized at 45 psi in Oil-Mist unit

MILLING

For setups on milling machines, the ⅛- in.-dia tube nozzles are usually positioned to direct the airstream toward the work surface being cut, and slightly into the periphery of the cutter. In the case of face mills, or with the side face of a saw or side cutter, the nozzle is positioned at a small angle, usually 5° to 7°, with the axis of the cutter. The open end of the nozzle is usually placed approximately 1½ in. away from the work surface, and about ⅜ to ½ in. from the periphery of the cutter.

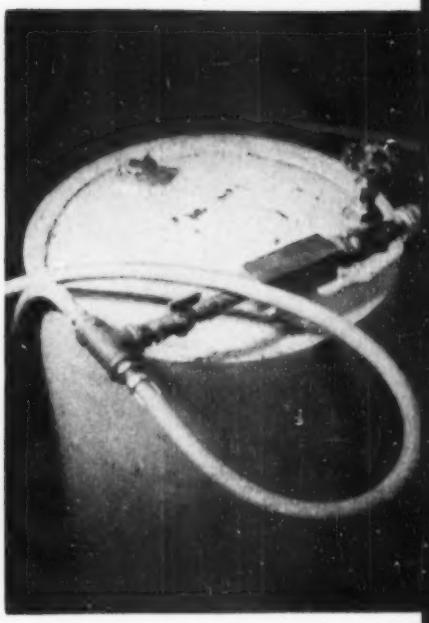
An Oil-Mist injector has been applied to a large face milling operation in one of Allison's transmission plants, with good results. On this job a 32-in. OD, carbide-tipped face mill finishes the joint face on a large cast-aluminum transmission cover. Speed is 356 rpm; feed is 12 ipm. When cutting dry, only about 75 pieces could be milled before the teeth needed resharpening, in order to maintain the required surface finish. With undiluted Metalloid X-30 base sprayed onto the cutter periphery through a ⅛-in.-OD tube at approximately 30 psi, cutter life has been increased to more than 300 pieces.

In a recent test, the spray was turned off and the cutter milled 70 pieces, until it was almost dull enough for resharpening. Finish was rougher than desired. Then the spray was turned on. Immediately the finish improved, and the cutter continued to produce a satisfactory finish for more than 200 pieces.

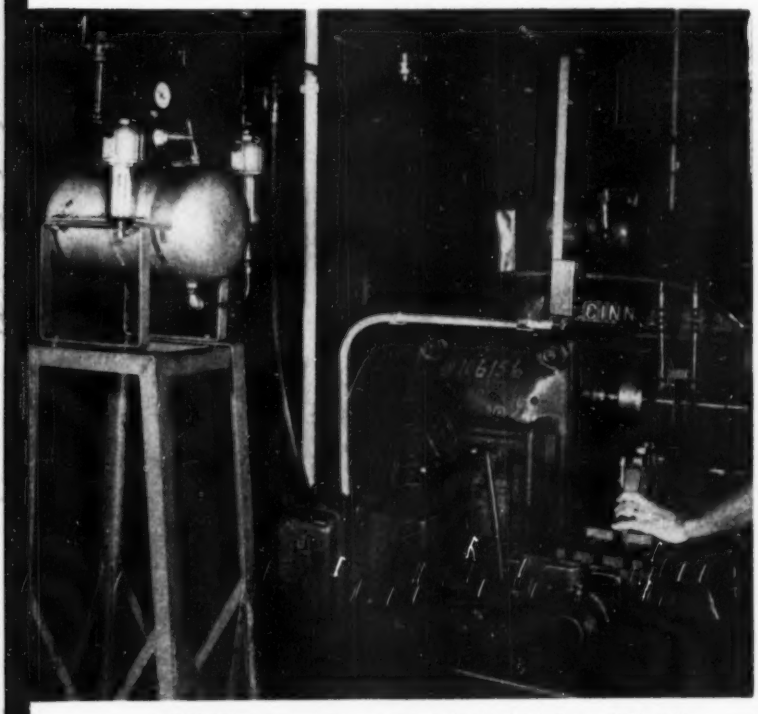


MILFORD ATOM-LUBE spray head applied to typical milling job

FOUR ⅛-IN. COPPER TUBES form the nozzles in the spray cooling system on this Kearney & Trecker No. 4 vertical mill in which a 4⅛-in.-dia carbide cutter machines an SAE 4340 forging for an Allison transmission. Cutter life between grinds was doubled, and trouble with heat-cracked carbide bits when cutting dry was eliminated. Speed was increased from 268 to 352 rpm



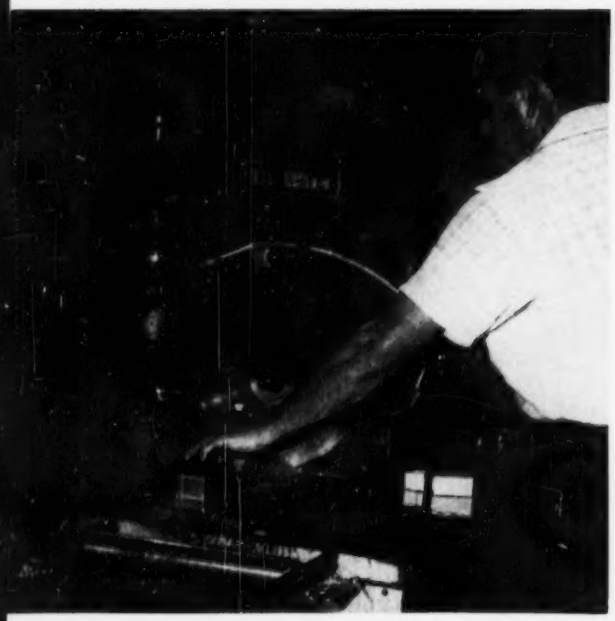
NOT ALL UNITS seen were elaborate. This experimental injector operating at full airline pressure vaporizes 30-to-1 water solution of Metalloid WOS base, which is sprayed through four nozzles on Kearney & Trecker vertical mill in Allison plant. 10-gal tank can be moved to other machines



INJECTOR is mounted on stand in back of Cincinnati 2-24 miller in this Studebaker setup for straddle milling the root ends of 410 stainless jet turbine blades. Milling 2 blades per setup, cutters average 700 to 800 pieces per grind

ACRO-COOLANT in 24-to-1 water solution is sprayed from short ⅛-in.-OD nozzles along inside surfaces of 6-in.-dia side mills in this Studebaker setup for finishing jet turbine blades. Nozzle tubes are held in compression fittings on ends of ¼-in. pipe supply lines

Applications of mist coolants:



SMOKE AND SPLASHING OIL caused by high-speed sawing of aluminum alloy extrusions (mostly No. 63S-T5) with conventional cutting fluid system made this operation on a DeWalt saw an unpleasant job. Often work had to be stopped for cleanup of machine and floor

USING SIX SPRAY NOZZLES fed from Oil-Mist unit, without changing saw or its speed, resulted in improved saw life, better working conditions and cut oil consumption to 32 oz daily from 15 gal daily at each DeWalt saw used to cutoff aluminum alloy extrusions. Smoke and fumes no longer interfere with worker's comfort

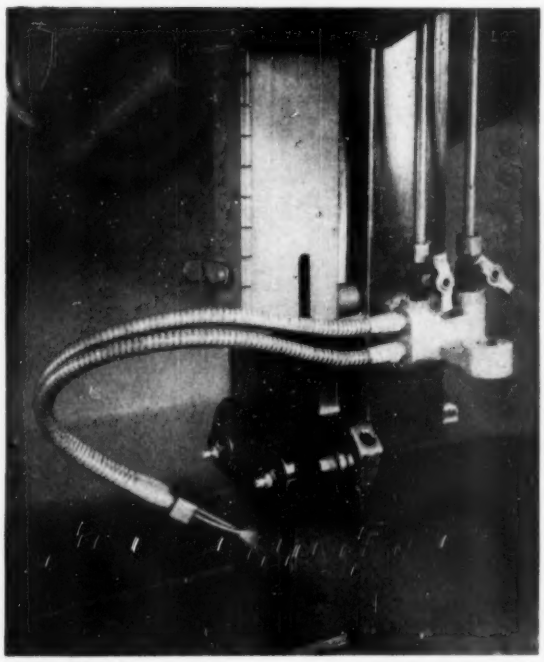
HIGH-SPEED SAWING

Mist cooling works well on high speed sawing, on which flood cooling often leads to serious work hazards. Floors are splashed, work areas are filled with smoke, and excessive oil consumption is common.

In one operation, cutting oil consumption was reduced from approximately 15 gallons per 8-hr shift to 32 oz per shift for each of three DeWalt saws converted to Oil-Mist spray cooling. The 16 x 3/16-in., 120-tooth blades operate at 3400 rpm.

With flood cooling delivering nearly 2 gal. per hr of paraffin-base cutting oil cut with naphtha (cost, 28¢ per gal.) to each saw, a lot of oily smoke was generated, saw life was low, and it was necessary to stop the machines frequently to clean the work area. Some 100 lb of fuller's earth was used daily to clean oil from the floor around the machines. Also, when the three machines were running at the same time, it was often necessary to stop work and open shop doors to blow out the smoke.

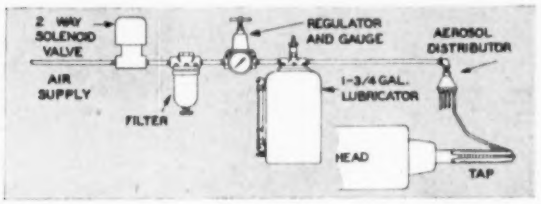
On each machine converted to spray cooling, a standard 12-oz. Oil-Mist unit delivers a mist of EP-22 oil to six spray nozzles directed to spray both faces of the circular saw blade. The nozzles were opened up with a No. 40 (0.098-in.) drill. Solenoid switches turn off oil spray when saws are not in operation. Elimination of machine down time, increased production, improvement in saw life, reduced consumption of cutting oil, and improved working conditions made such savings possible that installations paid for themselves in 10 weeks.



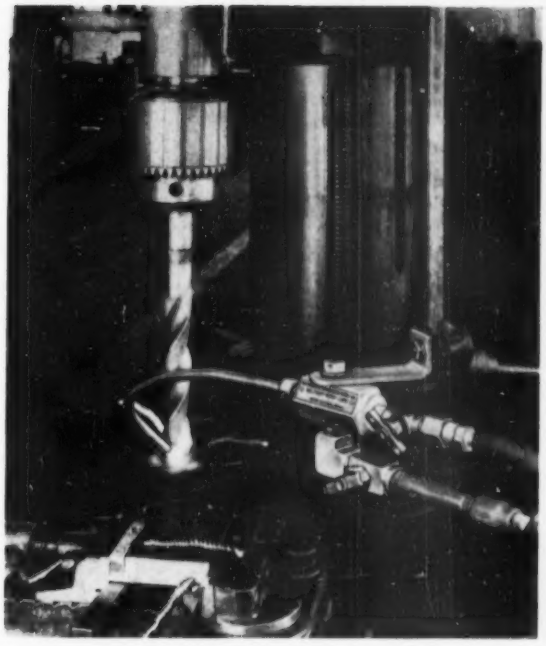
CAREFUL TESTS showed that mist cooling of this DoAll saw blade increased blade life five times over dry cutting on aluminum test strips. Speed was 3000 fpm; pressure, 50 psi; lubricant applied at 120 drops per min

DRILLING AND TAPPING

Lubrication of a small high-speed tap with an Oil-Mist unit was accomplished almost two years ago, by the Supreme Knitting Machine Co (*AM*—Jan 7 '53, p121). This was done on the tapping spindle of a Kingsbury 7-station machine making a brass fuze part. With conventional flood cooling, the 0.277-in., 40p, NS Class 1 tap would pick up brass and tear threads, no matter what cutting fluid, tap grind, or spindle speed was used. With the Oil-Mist unit spraying a mist of spindle oil, turpentine, or kerosene on the tap, more than 15,000 pieces could be finished before regrinding the tap. Best results were obtained with kerosene, with the regulator set at 20 psi. The 12-oz. reservoir was filled only once every 40 hr of operation.



NORGREN OIL-FOG lubrication systems have been used on a number of high-production multi-spindle tapping machines in the automotive industry. Nozzles can be either single tubes, or round manifolds which encircle each tap, spraying fluid all around the tap. Such units generally spray cutting oils or SAE 10 oil at about 20 psi



TYPICAL TWIST DRILL SETUP, with Thompson Atom-Lube unit. Mist-cooling of conventional twist drills is effective only to a max depth of 2 or 3 drill diameters

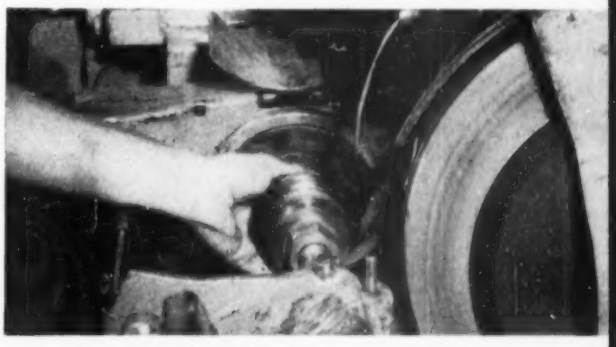
GRINDING

Spray cooling is not generally effective for grinding steel parts with bonded abrasive wheels. Wheels load more rapidly than when flushed with regular flood cooling. However, one aircraft plant solved a difficult finishing operation on a nitrided (hardness, 60 R.) steel part by mounting a two-nozzle spray system on a 6 x 18 Landis angle-head grinder. (See illustration.) Previously, no matter what cutting fluid was tried, they had been able to finish only 1 or 2 pieces per dressing of the wheel, and scrap loss, primarily because of heat cracks, averaged 50%. Wheel now finishes 15 to 18 parts per dressing, and scrap losses are negligible.

It is important to note that the spray system on this grinder does not prevent wheel-loading. The wheel must be flushed with the flood system after each grinding cycle.

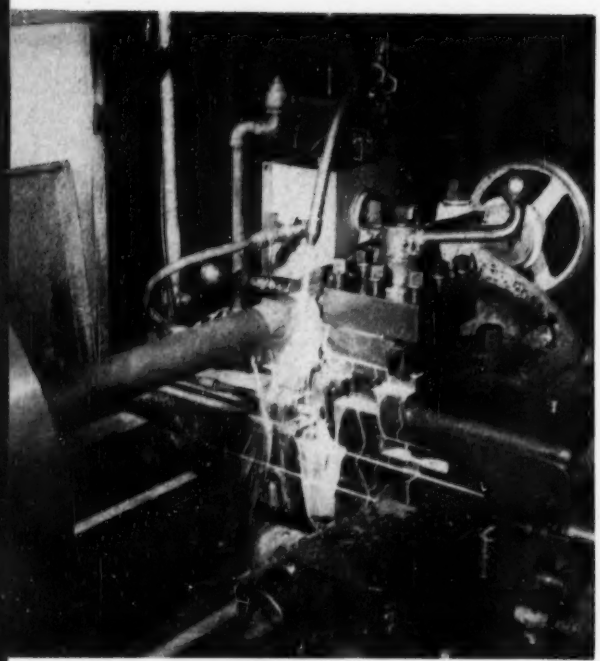
Other trials of spray cooling of cylindrical grinding operations were unsuccessful because of rapid wheel loading. In one test case, even three spray nozzles did not permit the plunge grinding of 0.001 in. of stock from the body of a ½-in. dia, 1¼-in. hardened steel shoulder screw with a 1¼-in. face wheel.

It must be remembered that spray cooling has been effectively applied to diamond-wheel grinding of carbide tools, and on broach grinding, so it may be that some tool engineer will find the proper combination of airflow, cutting fluid, and nozzle placement which will permit more widespread application of spray systems to bonded abrasive grinding. Perhaps a combination of flood and spray will turn the trick.

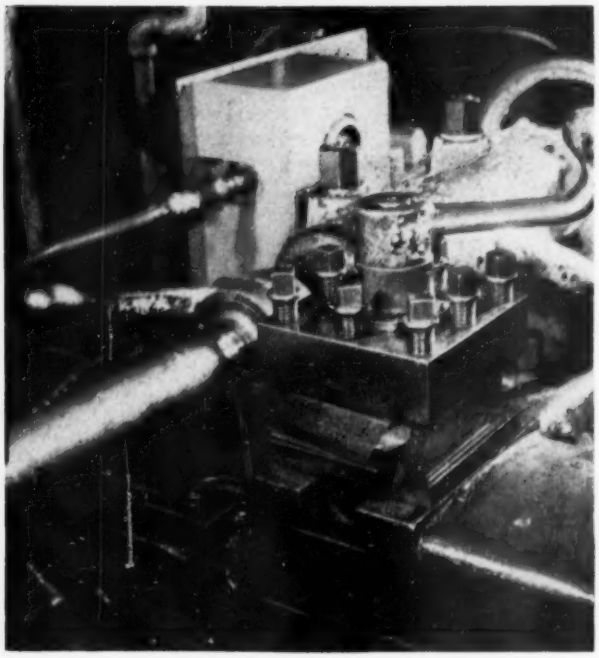


TWO ⅛-IN. OD TUBE NOZZLES, each 9-in. long, fed from Oil-Mist injector on portable stand, cool this vitrified bond, 180-grit aluminum oxide wheel removing 0.0001 to 0.0002 in. of stock from flange face, with surface finish of 1 to 1.7 mu-in. rms. Specified finish of 4 mu-in. rms was hard to get with flood system. Part is oil-seal for Allison turbojet engine; flange must be flat within 0.000030 in. Coolant is Metalloid X-60, cut 50% with kerosene, sprayed through 9-ft long, ⅛-in.-ID lines at 30 psi

Full flushing of diamond grinding wheels is usually advocated when grinding chipbreakers on carbide tools with the plunge-cut method introduced by Jan Taeysarts of Precision Diamond Tool Co. However, recent tests at the plant of Scully-Jones and Co show that a spray cooling system can be substituted for a flood system without changing grinding rate or increasing wheel wear.



AMERICAN 20-IN. ENGINE LATHE in Allison plant turns SAE 4340 shafts with carbide-tipped tools, is equipped with conventional flood-type coolant system (shown) and Oil-Mist spray system for comparative tests. With flood system, operator and floor are splashed with coolant, and machine needs cleaning frequently



TOOL LIFE is increased 30% when Oil-Mist unit spray cools turning operations on SAE 4340 shafts in this lathe. Spray nozzle is 3-in. length of ⅛-in. pipe set vertically in drilled block on cross slide and positioned so it effectively cools any of the four tools in turret. Oil-Mist unit vaporizes light Aeroshell oil at 20 to 25 psi

MILFORD ATOM-LUBE applied to circular sawing. Spray head can be positioned at any angle, bolted to machine. Suction hose to coolant tank can be up to 4 ft long

Economics of spray cooling are not yet fully determined. Costs of compressed air and coolant solutions are easily measured, but it is not easy to put an accurate value on such things as improved working conditions, less down time for changing tools, or general reduction of maintenance. Test installations have not been running long enough to form a complete picture of these less tangible benefits.

For further information on recent developments in metalworking coolants, these articles from American Machinist may be helpful:

Little High-Pressure Jets Cool Cutting Edges — Jan 21 '52, p281

CO_2 Cools Tools—Mar 3 '52, p129

How To Select A Cutting Fluid—Sept 1 '52, p118

CO_2 With SiC Grinds Carbide Tools—Feb 16 '53, p172

What You Should Know About Simple Cutting Fluids —Apr 13 '53, p154

Why Not Make Your Own Cutting Oil?—Apr 13 '53 p158

Why Boeing Wets Diamond Wheels—Apr 13 '53, p164

how to cut costs by

VACUUM-FORMING EXTRUDED PLASTIC

Large sheets of high-quality plastic, plus low-cost single dies, produce wide variety of parts with virtually no limitation as to size or contour

BY DOUGLAS WOODRUFF, JR, vice president, AUBURN BUTTON WORKS, INC, AUBURN, NY

Vacuum forming, or "differential-pressure forming," as it is sometimes called, is simple in principle. Only a half mold is needed. This is placed in a box over which a piece of plastic sheet is clamped. A heating element is placed above the plastic to soften it. The air between the mold and the sheet is suddenly exhausted, forming the plastic tightly to the contours of the mold. The sheet is then stripped off and trimmed.

Vacuum forming is not to be regarded as a substitute for the various methods of molding now widely employed. However, in a number of cases where another molding process might have served previously, the new process may be applied to greater advantage; and in some jobs, it is the only method which will permit the use of plastic at all. Several trends have converged to focus interest on vacuum forming, such as the availability of new and better plastics, economies effected by extruded sheeting, less expensive molds, the growing need for thin large-area parts, and other necessities of modern designing for mass production.

Biggest uses to date for formed sheet have been in the refrigeration, television, automotive, and novelty industries. Some typical examples are the masks used to frame television picture tubes, the long header bars in station wagons, aircraft window flashing, interior panels of refrigerators, machine guards, and reflectors. Hence, vacuum-formed plastic sheet finds its biggest opportunity as a substitute for metal stampings, papier-maché, plywood, and other tough, formable compositions. As wider sheets and larger forming equipment become available, this method will undoubtedly be extended to larger objects. Consideration is already being given to forming entire boat hulls from a single sheet. And in the near future, formed plastic with an enamel-like surface may replace porcelainized sheet steel for the outer cabinet panels on economy models of refrigerators, washers, freezers, room air conditioners, and similar household appliances.

ADVANTAGES

The process has a number of advantages. Designers are freed from many of the production limitations which apply to other types of material. Formed sheet parts can be designed to save time and money throughout all phases of production. Machining and finishing operations can be reduced greatly compared to those required for metal parts, and assembly time can be lowered substantially. Low die costs, particularly on short runs or where there are frequent model changes, and the ease and speed with which dies can be made, are outstanding virtues of this process. A good example is the small door panel on the freezing unit of a new refrigerator. If pressure molded, the dies for this one small unit would have cost $8,000 and delivery would have been 4 months. But because the part was vacuum formed, the dies cost only $1250, and panels were actually in production 4½ weeks after the first blueprint was received from the customer.

Still another advantage is the suitability of vacuum forming sheets for thin, broad-area objects. The same method was used for the same refrigerator to produce a 26 × 47-in. door liner with formed compartments 3½ in. deep. The plastic sheet does not corrode like metal and weighs about only one-third as much. Color, surface texture, and flexibility can be varied more easily than with other materials.

how to cut costs by

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Large sheets of high-quality plastic, plus low-cost single dies, produce wide variety of parts with virtually no limitation as to size or contour

BY DOUGLAS WOODRUFF, JR, vice president, AUBURN BUTTON WORKS, INC, AUBURN, NY

PRODUCTION ITEMS vacuum-formed by Auburn Button Works indicate wide range of sizes, shapes, and applications. Refrigerator door liner, upper left, replaces porcelain enameled steel or baked enamel fiberboard. Other items are business machine, display and refrigerator parts

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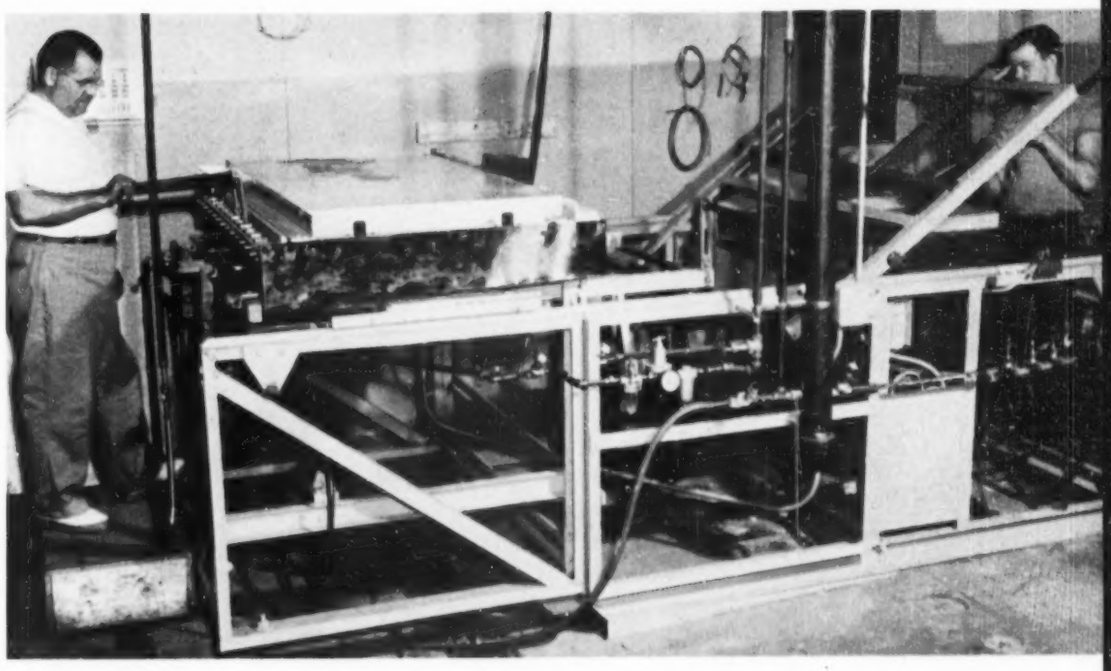
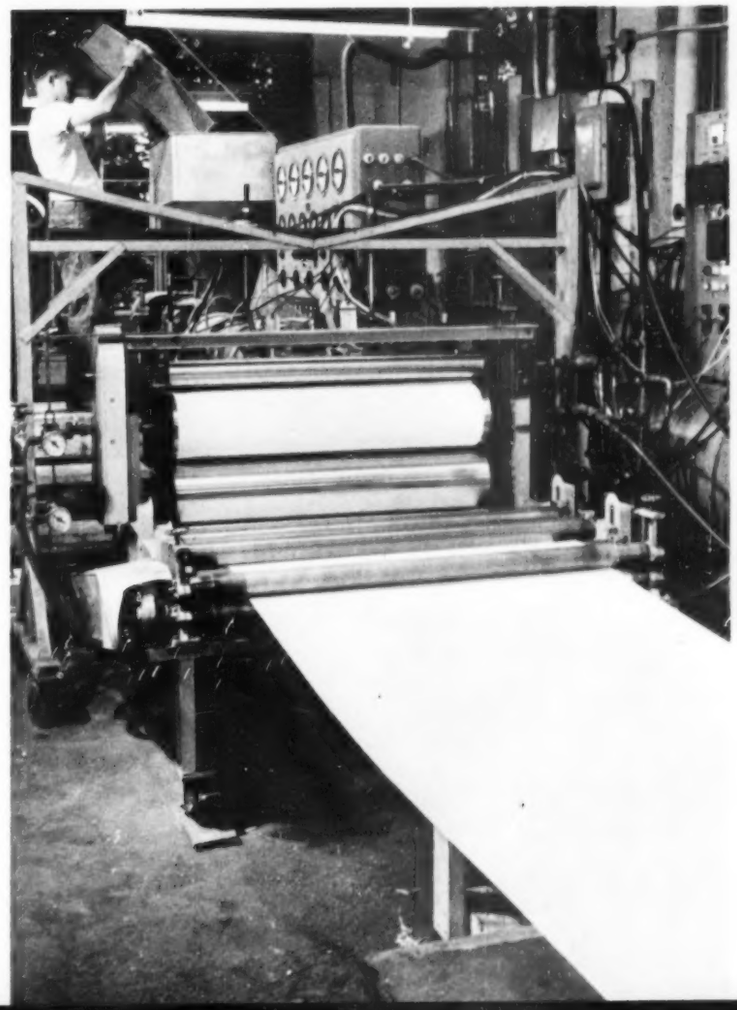
Vacuum forming is not new. Sheets of pyroxylin the first thermoplastic of commercial importance were vacuum-formed as long as 40 years ago. Auburn Button Works began to make pyroxylin shee in 1910 and continued until 1948, but the extent o its fabrication was always restrained by the explosiv nature of the material. This substance was cast i large blocks which were shaved off on a planer t form sheets of any desired thickness. These wer stabilized with camphor and placed in dry houses t cure for 50 to 80 days. The dry houses were smal stone buildings to minimize the possibility of explo sion and danger from fire.

Why was so dangerous a material ever used? Th answer is that it simulated costly ivory in every respect except for its high degree of flammability It was cheaper and far easier to form, and was th only thermoplastic available for many years. When it was virtually ruled out, plastic manufacturers turned to cellulose acetate, a material originally developed for photographic film. Although acetate i quite flammable it is nonexplosive. This material, too was produced in block form and the sheets were skived off with a blade. Later, acetate sheets were made successfully by casting.

PRESENT MATERIALS

When the New York World's Fair opened in 1939 a new plastic was exhibited – polystyrene – a synthetic material with more rigid characteristics than any previous thermoplastic. Three types of styrene are available commercially. The first is straight polystyrene, a transparent form recognizable by its metallic ring when tapped. It is often used for chil-





VACUUM-FORMING machine is double-ended. Operator, left, is heating sheet while other operator cools molded part with air blast before removing from mold. Heater slides to both ends, making operation virtually continuous

PLASTIC-SHEET extrusion machine converts white or colored pellets into continuous sheet of any desired thickness or width. Quality of sheet is highly important for successful vacuum forming

yroxylin, portance, ago. Au- ylin sheet extent of explosive s cast in planer to ese were houses to ere small of explo-

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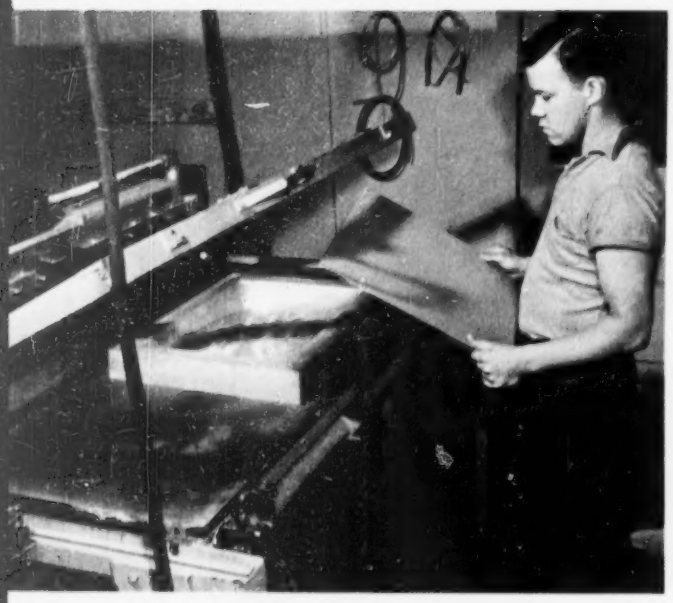
d in 1939, – a syn- stics than f styrene straight le by its for chil-

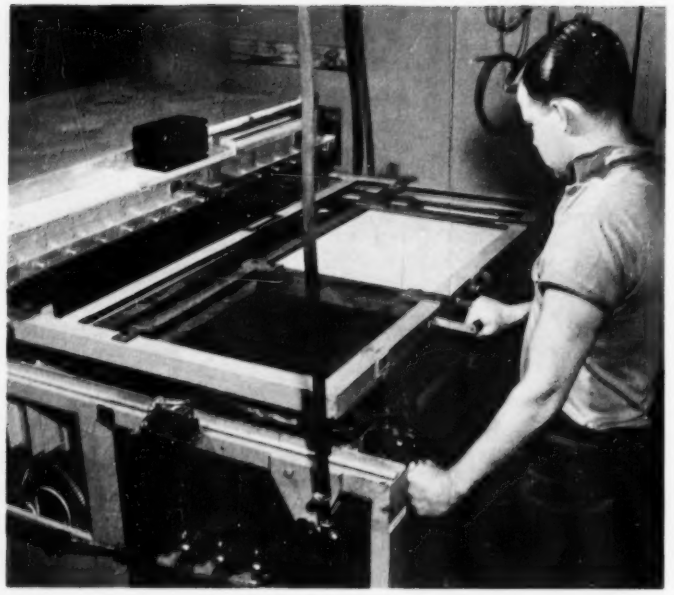
dren's toys and other small novelties where clear brilliance, hardness and sharp detail are desirable. In the second form, a small percentage of butadiene is aided to the pure styrene to reduce brittleness and increase impact resistance. The third form is the high-impact type to which has been added a larger proportion of butadiene, giving it a high .esistance to breakage. However, it is usually necessary to sacrifice one advantage to gain another in formulating plastics, and styrene is no exception, for the more butadiene that is added to reduce breakage, the lower the temperature at which distortion will occur.

Other new thermoplastics followed – ethyl cellulose, polyethylene, butyrate, the acrylics and vinyls – all extending the range of possibilities for formed plastic sheet. The continued introduction of better plastics, together with improved techniques in mold making and sheet forming have made this process increasingly important. This has served to emphasize the need for better quality sheeting, in larger volume, and at a lower price. Consequently, Auburn Button Works decided early in 1952 to extrude sheet on a continuous-production basis. This was a major undertaking, because whatever knowledge existed on the subject was a closely guarded trade secret. After considering the meager facts available and the limitations of the sheet being extruded, we decided to originate our own processes and design our own equipment from start to finish. This independent approach led to many new and radical developments, the result of which was a finer sheet than ever before extruded in volume. It was wider, finer textured, more uniform in gage, and less expensive.

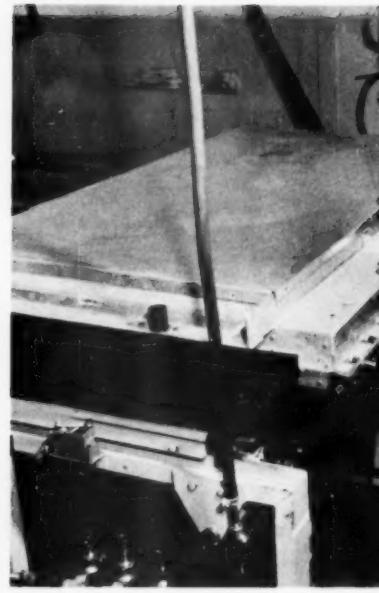
We are now extruding sheet in 42-in. width, rang-



OPERATOR places precut piece of extruded sheet over mold

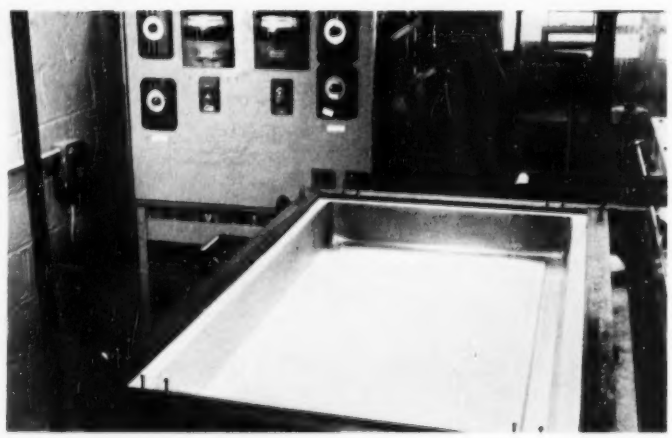


CLAMPING FRAME is pulled down and locked by clamps

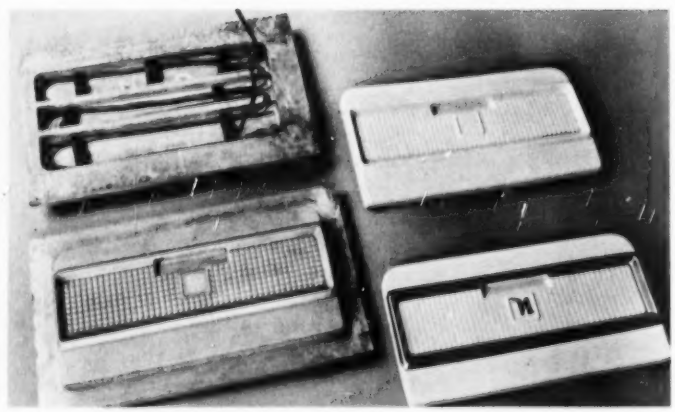


HEATER is drawn over sheet to soften it. Then va at predetermined time to draw plastic down ti

REFRIGERATOR-DOOR LINER mold illustrates size of parts already produced by the process. Larger parts will be possible as wider sheet is produced. Instrument panel controls time for each cycle, actuates vacuum control to remove heater, and maintains constant heater temperature



MOLD FOR REFRIGERATOR evaporator door. Note vacuum cavities on under side (top left) and copper tubes for circulating cold water to keep mold at low even temperature. Finished part (lower right) has been gold decorated



ing in gage from 0.010 to 0.187 in. Extrusion of 60-in. wide sheets is in prospect, and we are looking forward in the future to even greater widths. As the sheet can be made in any length, it is obvious that the shorter dimension of any object to be formed is limited only by the width of the sheet and, of course, by the depth of draw of the object itself. Therefore, as the technical problems of constructing larger extrusion dies are solved and it becomes possible to make wider sheets, new fields will be opened for the forming of larger products.

Auburn makes plastic sheet in any color, or the material can be painted if desired. The company also has an exclusive process for producing sheet with a surface gloss similar to porcelain.

MACHINE AND TOOLING

Commercially available vacuum-forming machines generally consist of a rectangular welded-steel channel and angle frame. At each end is a flat plate or molding area to which vacuum lines are attached. The mold is mounted on the flat plate molding area, the conditions of mounting being dependent upon whether or not the article is to be formed into a mold or over a shape, and the number of impressions to be made. The choice of a male or female mold is determined by careful consideration of all details pertaining to the contour and size of the part to be made: disposition of undercuts, required depth of draw, elimination of air-trapping voids, cost of mold manufacture, number of forms per sheet, and location of vacuum feeding holes.

After the mold has been properly mounted, a thermoplastic sheet is clamped firmly above it by a

it. Then vacuum is applied
ic down tighly over mold

AUTOMATIC CONTROL releases heater, allows it to roll back. Clamp frame is raised, and form is cooled with air and stripped from mold

DINKING DIE trims outer edge after center has been blanked out to form finished TV tube mask. Light deburring by hand is final operation

rectangular hinged frame. It may be necessary to use special or auxiliary frames in the forming of some objects to avoid trimming which would result in a critical waste problem. The importance of waste control cannot be overemphasized.

The heating screen and vacuum pump have been turned on five minutes earlier. The heating screen is rolled into position above the mold, the timer is set simultaneously, and the heating cycle commences. Heating time requires about 1 sec. per 0.001 in. of sheet thickness. Sheets up to ⅛ in. in thickness may be heated sufficiently by this one-sided application. When the heating time has expired, the vacuum release valve is actuated and the sheet is instantly drawn to the mold. The heating screen is rolled back and the sheet frame clamp released. A jet of air is blown over the formed sheet to cool and harden it and it is then removed. No ejector pins are needed to remove the part because the thermoplastic material is sufficiently flexible to be stripped quite readily from the mold by hand, even though there may be a moderate degree of undercutting. Automatic ejection is possible by inducing positive air pressure back through the air evacuation passages, thus blowing the part from the mold.

MOLD TYPES

At least four different types of molds are now being used successfully but, with improvements being made every day, it is safe to say that more efficient methods will continue to be forthcoming for some time.

The cast plaster mold is the simplest to make but is primarily a pilot mold. There are two commercially manufactured plasters which are well suited to this purpose because of their high strength and dimensional stability. The first step in making the plaster mold is to spray a sample of the part to be made with a parting aid. A casting box is made and the liquid mix is poured about the treated sample, according to the amount of exposure desired, and allowed to cure. After curing, the part is stripped from the plaster, leaving the imprint or female mold. The mold is retouched where necessary, cleaned and smoothed. Locations of the small evacuation holes are determined and drilled. This type of mold is inexpensive and fast to make, but should not be considered for long-range production. Although it is not too durable, it is an invaluable guide for experimentation prior to making a more expensive mold, and for producing quick test samples.

Cast-resin molds may be used where a good surface is required for metal spraying, and where accuracy of duplication is important. Casting resins are available for this purpose. Their method of fabrication is approximately the same as for plaster molds. They appear to be more durable than plaster but should not be considered for continuous high production.

Machined, engraved, sprayed metal, cast or hobbed molds are best, although admittedly the most expensive. The great strength of these molds is not altogether necessary but, for sustained accuracy on long production runs, they prove their value. There is no substitute for quality in molds.

A stock of plastic sheets is cut to size to fit the top of the mold with an eye to minimum waste. The temperature of the heating screen is maintained at approximately 700 F. It is important that the mold itself be held at a consistent temperature, as determined by experience, during the repeated production cycle.

TRIMMING AND FINISHING

Vacuum forming leaves a flange or waste edge which, on nearly all jobs, requires trimming. In the case of a multiple-cavity draw – that is, a mold which permits the forming of several duplicate parts at one time and out of one sheet – separation of the parts involves an additional operation. To separate a gang of identical parts on a single sheet, a dinker or clicker press is the best method for most runs. The cost of these dies naturally varies with the shapes to be blanked out. Perfect rounds and sharp corners, straight-sided polygons and rectangles are the least costly. Irregular compound shapes, parabolic, elliptical and involute curves are the most expensive. These dies may run anywhere from $10 to $500 each, depending upon size and shape, but dinking is a fast clean operation. In most cases the cost of the die and the labor time to dink is all that need be considered. When precision trimming is required, nesting or locating apparatus must be provided. On some jobs, additional steps such as spray painting and assembly may be required to complete the order.

Sheet forming is still in its infancy. Many developments are yet needed to adapt it to automatic mass production. Improvement in mold making and finishing equipment can also be expected. Nevertheless, the process has already proved its practical advantages for many types of parts and products, and has shown remarkable gains for the short time it has been in use.

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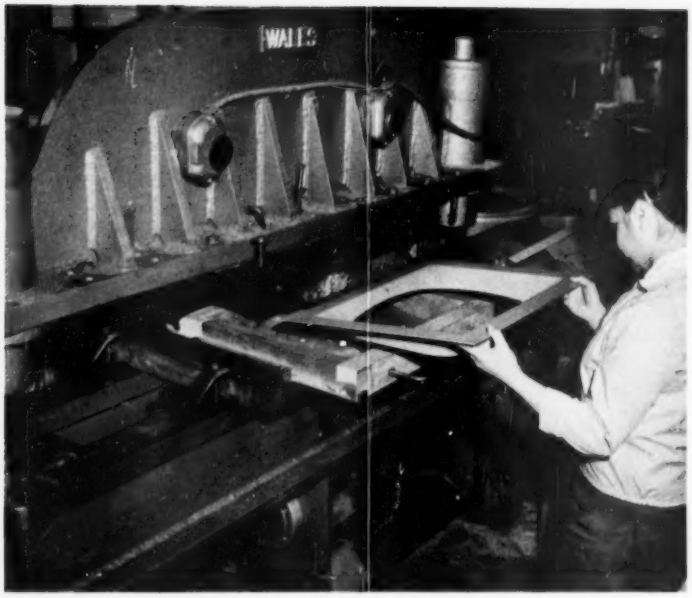

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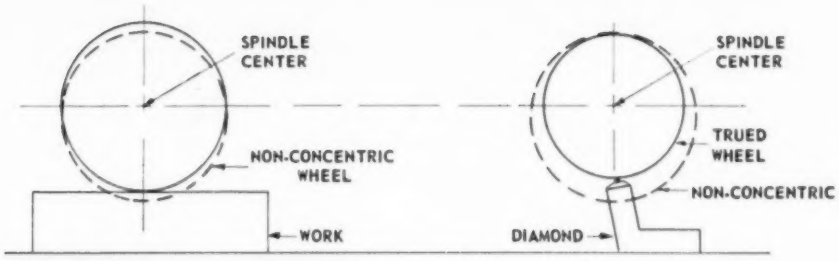


EFFECT OF NON-CONCENTRICITY (exaggerated) between wheel and spindle. Non-concentric wheel will gouge work at one point, miss it at another, causing rough, inconsistent finish. Truing removes high spots and centers wheel on spindle

how to PREPARE WHEELS FOR BEST RESULTS ON TOOLROOM GRINDERS

Many grinding troubles can be traced to improper wheel truing and dressing. Here are some simple instructions on how to eliminate them

BY M A BERGSON, Engineer, THE DoALL CO, Des Plaines, Ill

In too many instances, the relationship of good results in surface grinding to proper wheel preparation is not realized. Too often the operator blames the machine when good results are easily within his reach through the relatively simple expedient of preparing the wheel properly.

Truing the wheel is the most vital requirement affecting results in surface grinding. It involves the concentricity of the wheel periphery with respect to the exact center of the spindle; and the relationship of the wheel periphery with the working surface of the grinder at the point of work. These relationships must be "true," otherwise chatter and inaccuracy will result. The full importance of truing is not generally appreciated and operators frequently concentrate on other aspects of wheel preparation and do not give enough attention to this fundamental requirement.

Efficient cutting action is the next requisite. Grinding wheels are composed of hard crystals bonded together with a friable material. Each crystal is a miniature cutting tool whose sharp, jagged edges take minute chips out of the work. As a wheel is used, these edges are worn or broken away and the pores in the wheel face fill up with chips. Thus, the cutting effectiveness of the wheel decreases and, carried to the extreme, the wheel would cease to cut or grind but would merely burnish and burn the work. When the wheel is dressed, the used surface is broken away and fresh, unused crystals are exposed.

Correct wheel shape must also be considered. The principle of grinding to a form with a shaped wheel is coming into wider use because of the rapidity of production and fine finish obtained. A dressing diamond mounted on an appropriate dressing fixture and fastened to the grinder table is one means of dressing a form onto the periphery of the wheel. The diamond can be swung in calibrated arcs and planes to obtain the desired form.

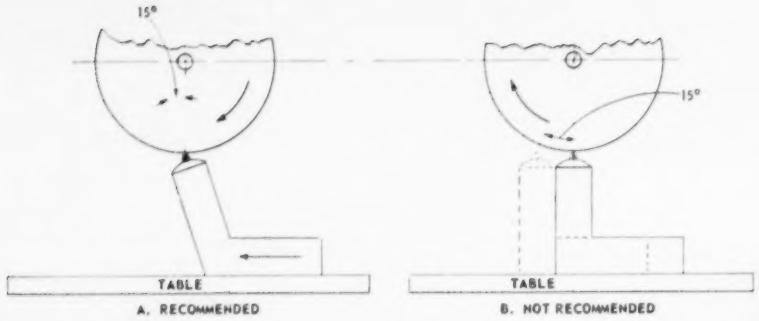
Another method involves shaped steel rolls which move against the wheel under pressure and crush off certain areas to achieve the desired peripheral form. The crush method can also be used for flat dressing, although this is not usually done.

Note that truing, dressing, and forming are essentially destructive processes in which a certain amount of wheel material is broken away.

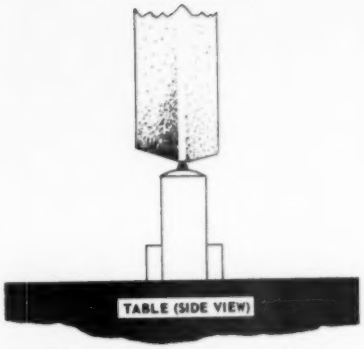
TRUING AND DRESSING

A properly trued and dressed wheel is a major step toward accuracy and good finish, plus wheel economy. Such operational results, however, also depend on other factors, including choice of the proper wheel, and rigidity and accuracy of the grinder and spindle. These qualities of a grinder are vital in properly truing and dressing the wheel. Obviously, play and excessive spindle runout, and lack of rigidity in the column can make it virtually impossible to obtain a wheel of true concentricity and of sufficient stability for smooth finish and accurate surface grinding.

Fit of the wheel on the spindle is also important, but this is usually taken care of adequately by the wheel adapter. Ordinarily, the slight amount of inaccuracy between wheel and spindle is of no concern, as this is readily compensated for in the truing process. It involves, of course, the removal of wheel material in certain areas to obtain the full concentric form. In the case of diamond wheels, however, which are expensive, initial lack of concentricity is important because the small amounts of material removed represent a considerable investment. With diamond wheels, therefore, it is always desirable to align the wheel as closely as possible to obtain full concentricity. This can be done by a dynamic balancer or indicator.



POINT OF APPLICATION and angular relation of diamond is highly important in obtaining a proper dress with minimum diamond wear



POSITION DIAMOND so dressing begins at highest point of wheel periphery. If dressing begins at sides of ridge, too deep a cut may be taken and wheel or diamond damaged

Insofar as the processes of truing and dressing are concerned, this discussion will deal with the techniques used for grinders with chuck sizes of 6 × 18 in. to 10 × 30 in.

TRUING AND FLAT DRESSING

Because flat-faced wheels are most commonly used in surface grinding, the information given here will deal primarily with that type.

Diamonds are generally used for truing and dressing. Often both operations are accomplished simultaneously, as the same tool is used, and in a similar fashion. However, different objectives are involved in each operation, and after a wheel has been trued it may or may not be dressed, as required. Always, truing must be the prime consideration, although, in truing, the desired dress can also be considered and both operations accomplished simultaneously.

The diamond is brazed into a setting which is placed in a holder mounted on the grinder table or the chuck surface. The author does not consider it advisable to mount the diamond tool on the wheel housing because the work rests on the table or chuck and, in truing and dressing, it is desirable to maintain the same relationship between diamond and wheel as will exist between work and wheel. In this regard the position of the diamond on the table with respect to the wheel is important for assuring wheel concentricity at the point of work. If the periphery of the wheel is not concentric with the spindle, the pressure of the wheel against the work will vary in accordance with the lack of concentricity, and the wheel will bounce violently at times against the work, and at other times may not touch it at all. Consequently, cutting will be uneven and a poor surface finish will be obtained, with chatter marks, burns, and cracks. Only when the wheel is perfectly concentric with respect to the work can smooth, even cutting be obtained. Where these true relationships are not maintained, uneconomical wearing of the wheel also results.

The diamond point should be so placed that it contacts the wheel at that point where the work contacts the wheel during a normal grinding operation; that is, at the lowest point of the wheel. The diamond can be placed directly under the wheel, exactly perpendicular to it. However, this tends to wear the diamond flat across the top, so resetting of the diamond is soon required. It is recommended that the diamond engage the wheel at a 5° to 15° angle. In this way the diamond will be worn at a bevel. Then, to present a sharp cutting surface to the wheel, all that is necessary is to turn the diamond in the holder so the high edge of the bevel contacts the wheel. The diamond holder angle is designed into many existing holders, and some have both vertical and angular receptacles for the shank.

SAFETY FACTOR

Some operators mount the diamond below the wheel perpendicular to the table at a point about 15° to the left of the center line of the wheel. However, this is not recommended because accidental lateral movements of the diamond to the right, i.e., toward the center line of the wheel would increase the pressure and introduce the possibility of gouging and damage to the wheel.

Note that some diamond holders have an arrow to indicate the direction in which the holder should be placed on the table with respect to wheel rotation. The arrow should point in the direction of wheel rotation as observed at the bottom of the wheel.

Before truing or dressing, the grinder saddle should be positioned and the wheel adjusted to that height where the cutting edge of the diamond will contact the highest point on the wheel periphery. This will prevent the diamond from taking too deep a cut.

TRUING SPEED AND FEED

To begin the truing operation, lower the wheel until the high point touches the diamond. Then start the cross feed so the diamond traverses back and forth across the wheel face. Lower the wheel one to two thousandths per pass for rough truing and not more than one-half thousandth on the final setting. On a rigidly built and accurate grinder, these increments can be read directly from the wheel calibrations. Final cuts must be light to minimize pressure against the spindle and the possibility of non-concentricity.

In this regard, the importance of having a sharp diamond for truing cannot be over-emphasized. A sharp diamond cuts more readily

and subjects the wheel to less pressure, particularly when high or dense spots are encountered. Dense areas resist the cutting action of the diamond more vigorously, and if the diamond is dull, the wheel tends to ride over the diamond, springing the spindle and introducing wheel eccentricity.

Further, a dull diamond dulls the wheel, particularly in the dense areas, by destroying the cutting edges of the wheel particles. Thus, the dense areas become high spots which burnish and burn the work, cause cracks and over-all poor finish and appearance.

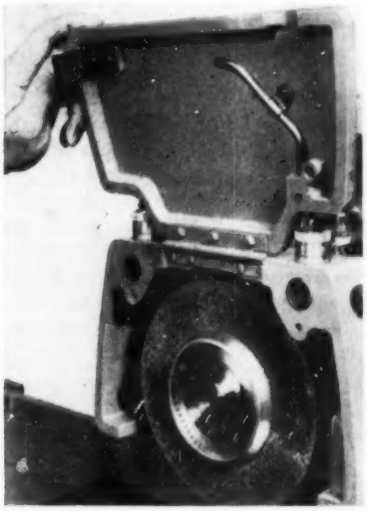
CROSS FEED SPEED IN TRUING

Cross feed speed is determined essentially by experience. However, one general rule can be established; when wheel structure is coarse with large, widely spaced grains, use a faster traverse. For wheels with fine, closely spaced grains a slower traverse is necessary. The reason for this lies in the wheel composition. The diamond shears away the bonding material, loosening the cutting crystals which either fall out or are knocked out. The wheel is properly "flat trued" when all the outermost cutting edges of a new layer of crystals are exactly on the same plane. Consequently, for a wheel with finer crystals the diamond must travel more slowly to make certain that every grain in the wheel face is subjected to the leveling action of the diamond.

When the final setting has been made for the last truing cut, pass the diamond repeatedly across the wheel face until it ceases to remove material. An indication of this is obtained by observation of wheel sparking or by holding the hand to the left of the wheel (if wheel revolves in clockwise direction). If particles are felt to strike the hand, continue passing the diamond. During these final passes note that the diamond is cutting evenly—not sporadically. The stream of particles against the hand should be constant rather than intermittent. This is an indication that the wheel is concentric, and the diamond is cutting evenly around the periphery.

Whenever the wheel and its adapter are removed from the grinder spindle and replaced, the wheel should again be trued.

It is urged that coolant be used while truing and dressing to protect the wheel and diamond from excessive heat. The higher the temperature of the diamond, the more quickly it is worn down. Furthermore, this heat is transmitted to the setting and holder, causing them to expand erratically and introducing wheel irregularity.



COOLANT fed into perforated washer is forced through wheel pores to cutting face, insuring constant supply at contact point. Special design of DoAll machines permits use of standard wheels for this application

WHEEL DRESS

After a wheel has been properly trued it may or may not have the desired dress. If the wheel is to be dressed for removal of material at a moderate rate and a fine finish is also desired, its face should be as even and flat as possible. This may have been accomplished in the truing process but, in general, a wheel should be purposely dressed for the finish desired. Sometimes, however, the wheel will be heavily loaded, and if sufficient material was not removed in truing, some of this loading may remain in the trued wheel. Loading diminishes cutting efficiency, so additional material must be removed.

DEGREE OF DRESSING

The question then arises as to what is the proper amount of material to remove in a flat dressing operation. The color of the wheel and knowledge of the depths of cut taken during the regular grinding operations prior to dressing can be a guide to this. A wheel will tend to load more or less according to the depth of cut taken during grinding. Loading tends to discolor or dirty the wheel. One criterion, therefore, as to whether the wheel is properly dressed is whether the wheel face has a fresh, clean consistent color and is at the same time flat. Generally, the amount of material to be removed depends on the maximum depth of cut taken during grinding. Thus, if 0.020-in. cuts have been taken, 0.020 in. of wheel material will have to be removed from the wheel face. It is recommended that 3 to 5 thousandths more be removed to make sure of a clean wheel.

Some operators touch the wheel while it is revolving to determine that it is flat and smooth. This can be dangerous, as the hand may be carried into the wheel housing or the diamond holder. To assure fine finish on flat grinding jobs, round off wheel edges with a hand stone or a precision tool. A wheel which vibrates after it has been carefully dressed should be discarded.

After a clean sharp wheel is obtained, the operator may determine that rapid removal of material is paramount and finish secondary. He can, therefore, omit the finish dress on the wheel or take another deep cut (0.001 to 0.002 in.) at a fairly rapid cross-feed. This leaves a spiral groove in the wheel face and provides a deep gullet for rapid stock removal and more effective cutting.

CRUSH TRUING AND FLAT DRESSING

Crush rollers can be used to true and flat dress the wheel. When this method is used, however, it is best to make certain that the spindle is sufficiently rugged and the column stable. Pressure should be carefully applied and should not be excessive. For truing and flat dressing, however, the diamond is generally recommended because it is easier to use and does not cause too great a pressure to be applied to the spindle. The crush method is generally employed for form dressing where time is saved because the desired form is evolved directly from the formed rollers.

Press Tierods Take Planning

Why are tierods used?

How are they adjusted?

Can improper use be dangerous?

Here are some important pointers and

a formula for applying the proper stress . . .

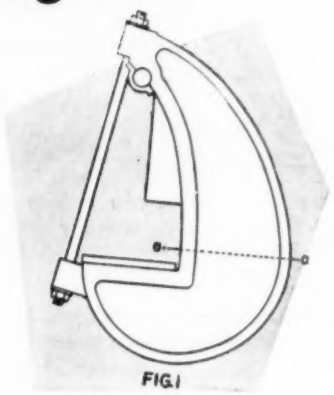


FIG.1

BY HENRY GIFFORD, Consulting Engineer, COMPOUND ENGINEERING CO, Bronx, NY

Tierods are not intended as an excuse for overloading a press. The capacity of a press is determined by the size of the crankshaft, and other components are designed around it. The crankshaft is turned from a forging and its strength can be determined with a high degree of accuracy. Also, the crankshaft is frequently mounted in a cast C-frame subject to a direct tensile load, plus a bending load, because of its shape. Being of cast construction, and in effect a curved beam, the ultimate strength of the frame cannot be predicted as accurately as can the strength of the crankshaft. In addition, the frame is the main body of the press.

For these reasons, press manufacturers design press frames so their ultimate strength is greater than the capacity of the crankshaft. An overload on a press usually results in a bent crankshaft. Because press capacity is determined by the crankshaft, why add tierods?

Tierods Reduce Deflection

Tierods on a press are intended to reduce press deflection under load. This reduction in deflection maintains better punch and die alignment during the working portion of the stroke. The result is reduced wear on the die. Press-frame deflection causes die misalignment and wear, even when a dieset is employed. For long life, a die should be mounted in a press rated 25 to 50% over the pressure requirements of the die. This applies particularly to progressive dies which frequently cost more than the press.

For the purpose of this explanation, dimensions are taken from an actual press. The C-frame shown (Fig. 1) is for a press rated at 40 tons. This first analysis applies to this press when used without tierods. The press throat at section a-a has a cross-section-area of 44 sq in. If this zone of the casting was of rectangular cross-section it would be as shown in Fig. 2.

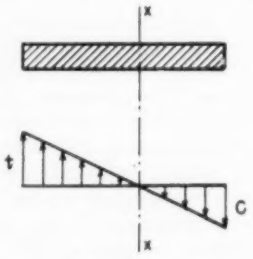


FIG.2

When in use the press frame is subject to a direct tensile load plus a bending load resulting from the work load being applied forward of the throat. Forces on the frame are shown in Fig. 2. The length of each arrow represents the stress, or load, on each fiber at that part of the cross-section. There are tensile stresses on the forward side of the frame, as indicated by the arrows pointing upward. Forces on the back section are compressive. The maximum tensile force, t, occurs at the front edge while the maximum compressive force, c, occurs at the back edge. As the stress goes from tensile at the front to compressive at the back it passes through zero. The section where the stress is zero is called the neutral axis, x-x.

Load Distribution

With the rectangular section, the tensile stress is greater than the compressive stress; in addition there is a lot of metal in the vicinity of the neutral axis where the stress is low. Cast iron is five times as strong in compression as in tension, hence a rectangular cross section would be a poor choice for this section because it results in tensile stresses higher than the compressive stresses. By taking some of the metal from the sides in the central section and moving it to the front, and by moving a small amount of metal to the back, the section changes to that shown in Fig. 3a. This section has 44 sq in. of cross section area as previously. With more metal at the front edge

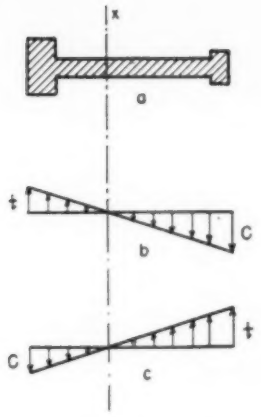


FIG.3

to take the tensile load the stress on each fiber is reduced. The tensile stress is now much less than the compressive stress, as it should be for cast iron, (Fig. 3b).

Now to consider the same press with tierods. When the tierods are added and pulled up tight, there is a tensile stress at the back of the frame and a compressive stress at the front as shown in Fig. 3c. This is the condition that exists between working strokes. Many shops pull the rods up as tight as possible. Some go so far as to heat the rods to elongate them so they can be tightened further.

This procedure is incorrect. When the rods on this press are tightened until they pull with a total force of, for example, 40 tons (20 tons per bar) the tensile stress caused by the rods is greater than the tensile stress caused by the work load when no rods are used. This condition results because the C-frame is designed to take a force of 40 tons tending to open the "C." The force applied by the rods tends to close the "C." When a work load of 40 tons is applied the stress in the frame drops to a low value. However, between strokes the stress is high. The highest stress occurs when the die is being stripped and the downward pull on the punches is added to the downward pull of the rods. This press takes 1½-in.-dia bars. If low-carbon-steel bars are used the yield strength for each bar is 35 tons. If alloy-steel bars are used the yield strength is as high as 175 tons per bar. Thus the press frame can be highly stressed by the rods. To go back, the rods are intended to stiffen the press and reduce deflection. In any structure deflection is proportional to the applied load, for loads up to the elastic limit. This relationship of deflection to load is shown in Fig. 4. If the rods are tightened lightly, enough to preload the press 4 tons (negative), the press is at point a on the curve. Now a work load of 40 tons brings the load on the press up to point b, for a positive load of 36 tons. The deflection of the press

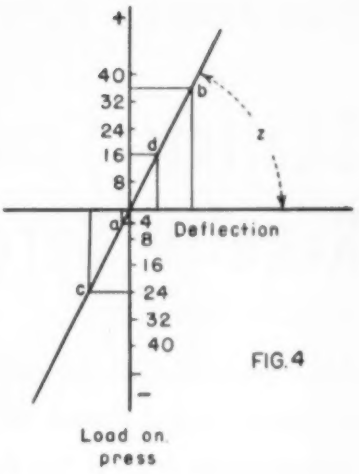


FIG.4

frame, when the load goes from point "a," to point "b," is 40 times the tangent of angle "z." If the rods are tightened to 24 tons total, the preload goes down to point "c." The work load of 40 tons brings the load on the press up to point "d", or 16 tons. Again the deflection of the press is independent of the initial tension in the rods. The rods should be installed with the nuts sufficiently tight to securely seat the threads. Additional tightening is useless and if carried too far may actually stress the press frame to a greater degree than is caused by the normal work load.

Tips FOR TOP SHOP MEN

467 Moderate "griping" is a sign of health. Remember the Navy commander who, after going all out to be sure his crew got turkey for a Thanksgiving dinner far from home, received as his accolade the statement, "Too damned much white meat!"

468 Personnel management is a popular book subject — but it cannot be learned from books. You must be interested in your employees and their problems, and have a sincere desire to help, or no book can do any good. A book can give you polish and procedure, but you'll have to supply your own heart.

469 "The way to a man's heart is through his stomach"—*still*. One source of good—or poor—morale in these days of purchased lunches is the plant cafeteria. You can lose a little on it if you do a good job of feeding — and charge the loss to human relations. You'll find it earns a profit.

"The accident happened just as my policy specified — injury to left toe, right foot, before noon, while wearing high top shoes with rubber heels."

Cope Talks on Draw Dies ... IV

Shallow Shells Require Careful Die Design

After permissible reductions, radii and clearances are established as given in installment III (AM–Aug 31, p96), the designer can choose from several die designs, according to part requirements

BY STANLEY R COPE, President, ACME SCHOOL OF DIE DESIGN ENGINEERING

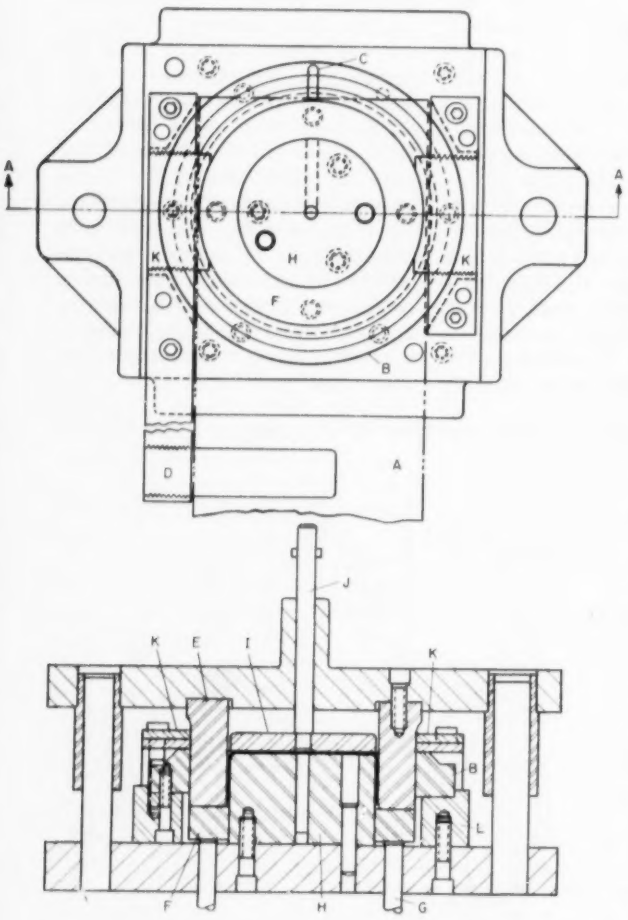


FIG. 1 . . . Die-set bushings should be long enough to insure entrance of guide posts, before the punch of a combination die starts to cut. This die, used in a straight-side press, is fed front to back

MEDIUM and large shells are blanked and drawn in straight-sided presses in dies similar to that shown in Fig. 1. The sheet is fed from the front to the back of the press, instead of from the right to the left. The operation of the die is as follows:

Sheet *A* is placed on blanking ring *B* and is pushed across the die until it strikes stop *C*. The sheet is aligned by stock guide *D*.

When the press is tripped, blanking punch *E* descends, cuts the blank to the correct diameter, and presses it against draw-ring *F*. Ring *F* is normally held flush with the top of ring *B* by pressure pins *G*. Continued descent of the slide causes lower drawing punch *H* to draw the metal from between the two confining surfaces into the desired shape.

When the slide ascends, draw-ring *F* strips the shell off the drawing punch and allows it to be carried up in blanking punch *E*. The shell is ejected near the top of the stroke by knockout plate *I* and knockout rod *J*. The blanked sheet is prevented from rising by plates *K* which are located on both sides of the die. It is not necessary to extend the stripper around the entire blanking punch because sheets with large holes are flimsy and strip easily.

Blanking ring *B* is set in torch cut plate *L* which is fastened to the die holder. Drawing punch *H* is doweled on the die holder, so it will not be necessary to counterbore that member. The punch and die details are mounted on a standard die set equipment with special, extra long steel bushings. Long bushings are necessary to permit the guide posts to enter the bushings a considerable distance before the blank is cut.

When it is necessary to stamp a design in the bottom of a shell the knockout plate must be machined to conform with the shell, and be arranged to bottom at the end of the stroke.

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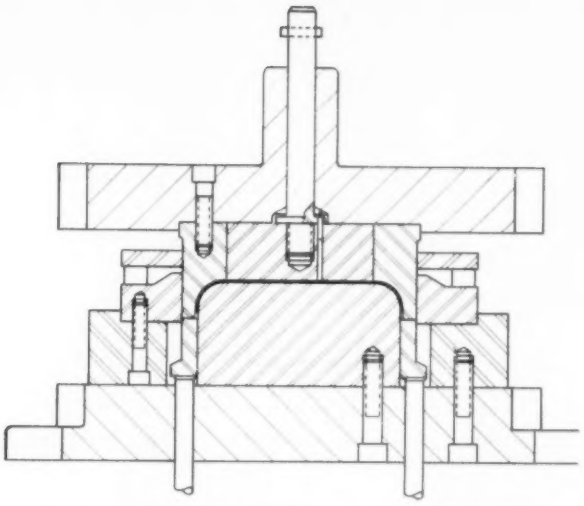


FIG. 2 . . . To prevent stamping a ring on the work, the knockout plate should bottom in a combination die made for shallow shells with little or no straight side wall

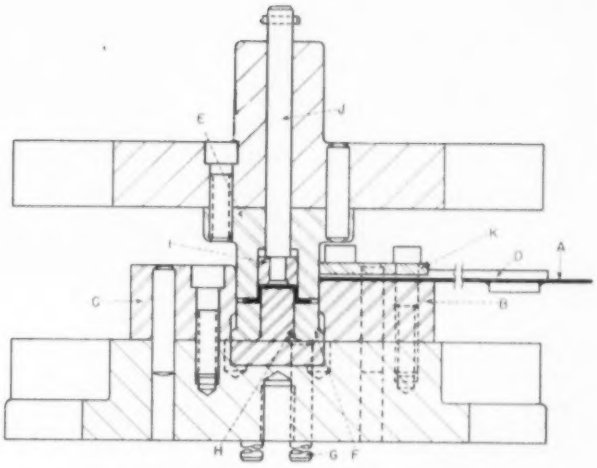


FIG. 3 . . . Shallow shells can often be drawn from a rectangular or square blank. The strip is pushed against block C for gaging the width of blank

If a shell has a flange and is comparatively small, or a design is to be stamped in the bottom, both the knockout plate and draw-ring should bottom. If the shell is large and has a flat bottom, the knockout plate should not be arranged to strike the work at the end of the stroke.

When a shell is shallow and has little or no straight side wall, the combination blanking punch and drawing die must be designed to "fit up" and strike the shell, as shown in Fig. 2. This die illustrates a principle employed in some shops to avoid counterboring the die holder for receiving the blanking ring and drawing punch. It is dangerous and often difficult to have a die holder revolving in the lathe at high speed with the guide posts in place. To avoid this the details are set in a plate which is screwed and doweled on the die holder. Either a spring stripper or a solid stripper can be used with this type of construction. When the latter type is used, the screws which fasten the stripper plate pass through CRS studs and screw into the filler plate.

CUTOFF AND DRAWING DIES

When a shell is shallow, and is of such a shape that it can be drawn from a square or rectangular blank, it should be made in a die similar to that shown in Fig. 3. Operation of the die is as follows: Strip *A* is placed on die block *B* and is pushed across the die until it strikes block *C*. It is kept in alignment by holding it against stock guide *D*. When upper die *E* descends, it cuts the blank to the correct width and grips it against pressure pad *F*. Pressure pad *F* is normally held flush with the top of die block *B* by pressure pins *G*. Continued descent of the slide causes drawing punch *H* to draw the metal between the upper die and the pressure pad into the desired shape.

When the slide of the press ascends, the shell is carried upward in upper die *E*. It is ejected near the top of the stroke by knockout plate *I* and knockout rod *J*. Plate *K* prevents the strip from rising when the blank is cut.

COMPOUND-COMBINATION DIES

When a hole, or a number of holes, is pierced in the bottom of a shell in a blanking and drawing die, the die is called a compound-combination die. Before you plan to pierce holes in this manner, first ascertain whether the holes will be stretched oversize or out of shape by the drawing action. Holes can usually be pierced satisfactorily in compound-combination dies provided that they do not have to be held within a tolerance of less than ± 0.005 in. Holes which may only vary 0.001 or 0.002 in. in size should be pierced in a separate operation.

If the shell is drawn to a considerable depth, the metal in the bottom of the shell is under considerable stress while the shell is being drawn. To avoid stretching the holes the piercing punches should enter the die only a short distance.

In the die shown in Fig. 4, piercing punch *A* and die button *B* are provided. A straddle-type knockout is necessary in this die to clear the piercing punch. Small drill-rod pins, shown at *C*, are turned down on one end and are riveted in the knockout plate. These pins are attached to plunger *D* by small screws.

As many holes as desired can be pierced in a compound-combination die, provided that the die can be sharpened easily and that the slugs can be disposed of without interfering with the drawing attachment.

DOUBLE-ACTION DIES

A double-action die for drawing a plain round shell is shown in Fig. 5. Blank *A*, cut to the correct diameter, is placed in the nest formed by spring pins *B*. It rests on die *C*. When the press is tripped the

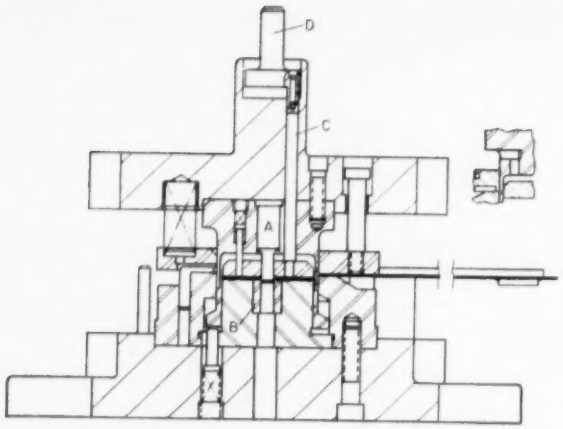


FIG. 4 . . . Compound-combination dies can be used to pierce holes in the bottom of a shell, if the holes need not be held to a tolerance of less than ±0.005 in.

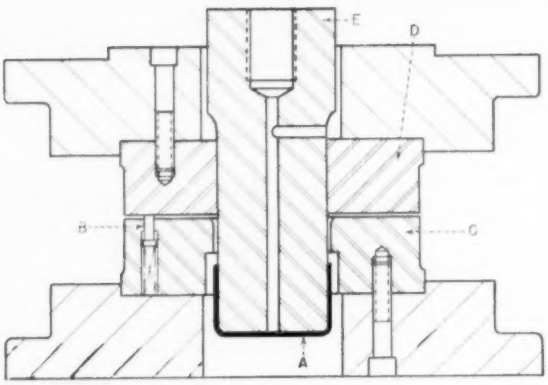


FIG. 5 . . . If the shell is not required to have a flange, a die used in a double-action press is permitted to push the work through

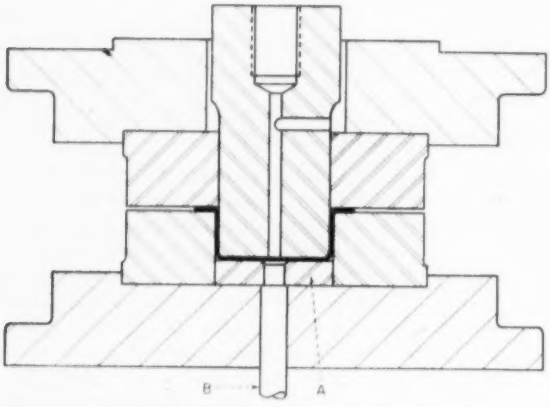


FIG. 6 . . . To produce a flanged shell in a die intended for use on a double-action press, it is essential to provide a knockout plate and rod to lift part out of the die

outer slide descends and causes blankholder *D* to bear against the blank. The outer slide then dwells while the punch slide (inner slide) descends and causes drawing punch *E* to draw the metal from between the confining surfaces into a shell of the desired shape. When the shell has passed through the die it expands slightly. It is stripped on the lower sharp edge of the die when the punch ascends.

WHEN KNOCKOUT APPLIES

When the shell has a flange, or when a design must be stamped in the bottom, the shell cannot be disposed of by allowing it to pass through the die and drop beneath the press. The die must be designed with a knockout plate and knockout rod as shown at *A* and *B* in Fig. 6. The knockout rod is actuated just before the blank-holder reaches the top of the stroke and ejects the shell from the die. The shell is removed from the die by a gust of compressed air directed against it, or by a stick, before another blank is placed in the gages.

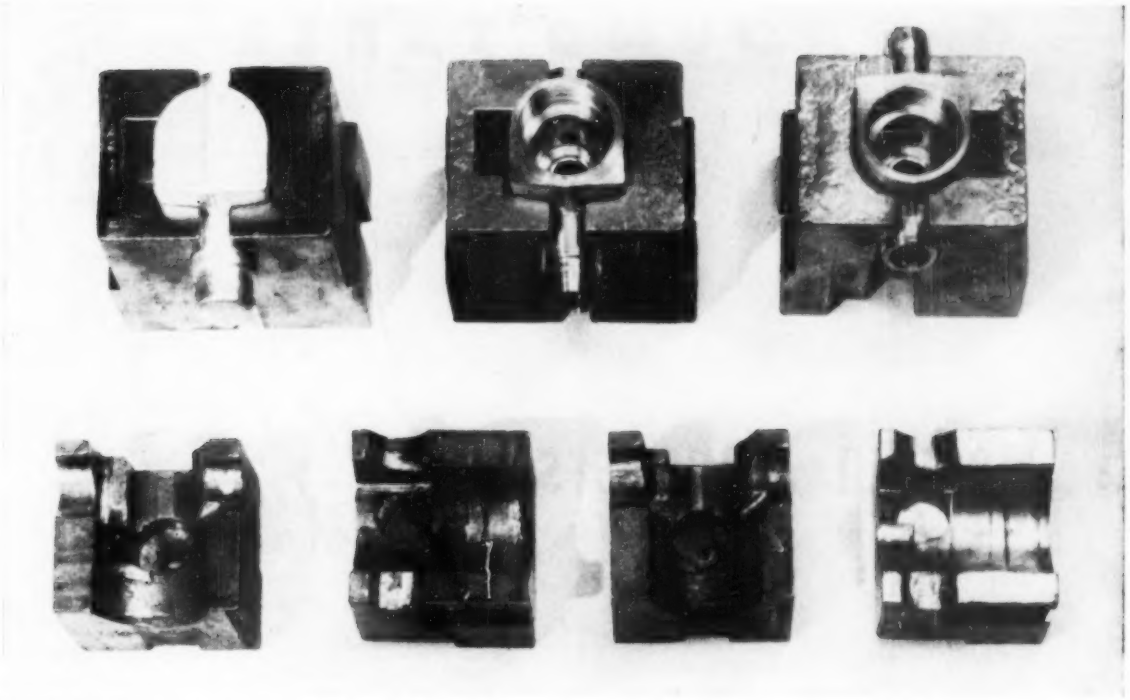
Shells may be blanked and drawn in one operation in a double-action die, providing that the shell is not too large. If the shell does not have a flange, and it is not necessary to stamp a design in the bottom, the shell may be disposed of through the die.

AIR VENTS

The close-fitting details of drawing dies create a sucking and pumping action. If holes are not drilled, nor other provisions made for escape of trapped air, the shells will be distorted or the die will be broken, depending upon the amount of trapped air present. Each die should be carefully studied for the location of pockets into which the air can be compressed. Large holes or slots should be machined where needed, to allow the air to escape quickly from these pockets. The air should be directed to the back of the press (or side of the press if a helper stands at the back) so it will not blow on the operator. Drawing dies are often covered with drawing compound which works its way into the air pockets. This compound is squirted from the hole at high speed, together with the air, and can create intolerable working conditions for the operator.

You can learn where air vents should be placed by observing the vents in the dies illustrated in this and succeeding installments. Notice particularly the large hole drilled through the center of each drawing punch. If a hole is not drilled in the punch, the flat blank, which is gripped between the drawing die and the draw-ring, will be distorted before the drawing punch reaches it. You must also be careful against leading the air down a "blind alley," that is a hole without an outlet. Air vents are frequently drilled in places where they are shut off by the slide or bolster plate when the die is placed in the press.

Part V of Mr Cope's series will appear in an early number.



KIRKSITE SLIP JAWS, cast around an actual workpiece, can be used for roughing and finishing, are easy and cheap to make

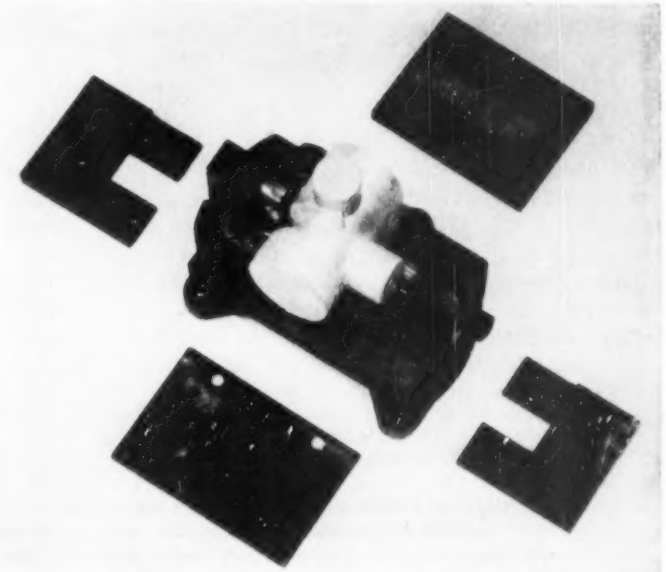
Cast chuck jaws save toolroom time

BY M MALONEY, Toolroom Supervisor, WALTER KIDDE & COMPANY, INC, Belleville, N J

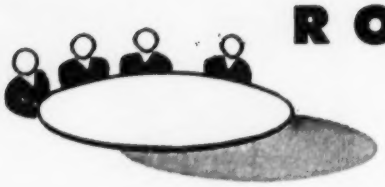
Carving out slip jaws for two-jaw chucks to hold irregular shapes has always been an expensive and time consuming job for the toolroom. Now the problem has been licked by Walter Kidde & Company, Inc, Belleville, N J, by casting the jaws from National Lead Co's Kirksite, using an actual part as a pattern.

An old chuck body has been adapted to act as a basic flask, and loose plates are clamped to this to form suitable dams. A bench and melting pot are set up in a corner of the shop, and one man can cast five sets of jaws in a day. This contrasts sharply with the 50 to 75 hr required to make one set in steel. The jaws last almost indefinitely, but when they become too battered they can be melted down and the metal reused.

No machining is required, beyond removal of flash, and the jaws can be put into service within a few minutes of casting. Because the metal is cast around the actual workpiece, a perfect fit is automatically guaranteed.

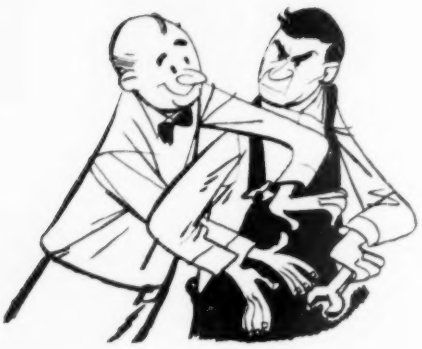


CASTING SETUP, showing workpiece in position and dam plates used to form sides of jaw blocks



ROUND TABLE

Meddlin' Managers



"What's the big frown for, Al?"

"Oh, hello, Ed. I was just stewing about Johnson—he's on the floor again; monkeying with my production, as usual."

"Well, look Al. After all, he's your boss—and pretty high up in the company, too. You'd better be careful he doesn't get wind of your resentment. After all, he's just showing an interest in what's going through the shop."

"Interest! That guy's got a psychosis or something. He paddles down here with his hair-brained schemes about twice a week—every week—and he really gets on my nerves! I'd like to know some good way to keep him locked up in that fancy executive office he has. Why doesn't he stay there?"

"That's funny, Al. I can remember the last plant manager—Burnside was his name. Everyone complained that he didn't take enough interest in what was going on down here. He was always playing golf and going off to cocktail parties. I guess you can never satisfy the guy in the shop."

"Boy, I'll take Burnside any day. At least he'd allow me to run my own department without interrupting my men every so often. Johnson is still out there in the miller section, playing around with some fool idea about a better fixture—on the brass-casting job."

"Maybe he'll come up with something good, Al. Last I heard you were fairly unhappy about that fixture yourself."

"That's not the point, Ed; and besides, Johnson's no engineer, and he's not likely to think up anything good. But the thing I object to is the way he comes down here to piddle his fingers in the pie. He doesn't know a damned thing about our problems. I should think a factory manager would have enough trouble of his own to keep him from looking for more."

"I imagine he has, Al. Maybe he comes down here to relax a bit. After all, if he can rest up at a slight expense in production to allow himself to make important decisions later, the loss in your time is very worth while."

"Look, if Johnson wants to relax, let's send him out to the country club. The hell with messing with my production schedules."

***WHAT CAN BE DONE** about the executive who fancies his abilities as a shop man? Can Al make a few pointed suggestions in a safe direction, or should he simmer down, considering the fact that his boss has a right to get his hands dirty once in a while? Your ideas on this subject may help others in similar trouble. Discussions of earlier topics appear on later pages.*

China gets into the act

Indicative of the way Russia is promoting machine-tool building in satellite countries to ease the burden on her own plants, is the recent development of a machine-tool industry in red China

BY R WESTGATE

Since the announcement that China is embarking this year on her first five-year plan to industrialize the country, it is becoming increasingly evident that development in the machine-tool industry is to be of prime concern to the Chinese planners and the Soviet experts assisting them. Existing manufacturing plants are being extended in the main producing regions—the Northeast (Manchuria) and East China (the Shanghai area)—and construction is reported under way on big new plants in the leading coastal cities and in the under-industrialized parts of the interior.

Most interesting development, and of the greatest potential importance, is the decision to establish a machine-tool industry in the remote Northwest this year. Some time ago, the Chinese government indicated its intention to make the vast Northwest "a second Soviet Siberia," and one of the great industrial bases of China but, until now, light industry and textiles have figured chiefly in stated plans. Machine-tool production would undoubtedly signal the beginning of a long-term program to make the area one of the most heavily industrialized in China.

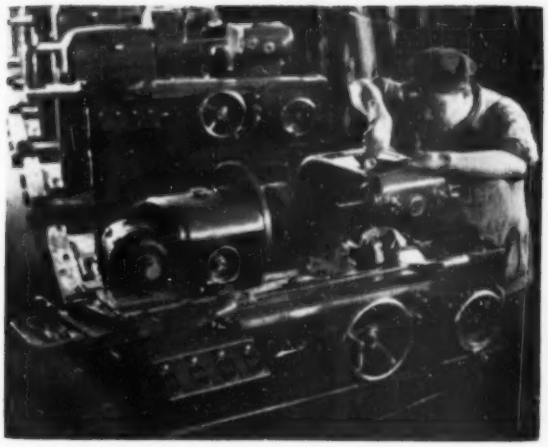
INVESTMENT DOUBLES

The five Northwest provinces (Shensi, Kansu, Ninghsia, Chinghai, and Sinkiang) and the municipality of Sian cover an area as large as India, and have a population of more than 23 million people. There are rich mineral resources, including the main Chinese oilfields and some of the biggest copper deposits. Before the war, industrial production accounted for only 5% of the area's total output but, by the end of last year, the proportion had been raised to 12%. Direct investment this year in the region's coal, oil, power, machine-tool, and textile industries will be double that made last year.

For some time to come, however, Manchuria will continue to be the most industrially advanced part of China, and plans under way there to expand machine-tool production are of far greater immediate importance than the long-term project now being started in the Northwest. Last year, according to Peking radio, the total value of the output of state-owned metal-working factories in Manchuria was more than 20% above the target figure. Output of machine tools was 25% above the planned figure, steam hammers, 170%, hoisting machines 40%, and cutting tools 94%.

All Manchurian machine-tool plants have been expanding since the end of the war on the Chinese mainland, and this year will see the beginning of several new plants. Thus far, blueprints are said to have been completed for more than 20 heavy industrial projects in Manchuria, including machine-tool plants, to cover 32 to 38 million sq ft. Development on a comparable scale is also going ahead in East China, and both state and privately owned machine tool plants in Shanghai claim all-time record outputs.

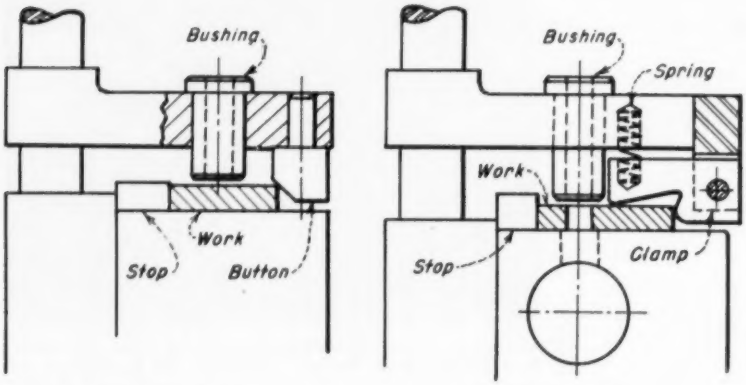
The setting up last summer of two government ministries for machine building has given an impetus to production by promoting greater standardization among the machine manufacturing companies. Greater imports of the most advanced types of machine tools from the Soviet Union and Eastern Europe have also assisted Chinese production.



ASSEMBLING GRINDING MACHINES, made in China for the first time in 1952. Soviet experts helped with the design, and machines are now in quantity production at the Chiu-Kiang plant, Shanghai. Before the war, plant produced farm tools but now concentrates on precision machine tools, claimed to be up to international standards

PRIOR TO PAINTING, a 2¾-in. horizontal boring machine is rubbed down by a five-man crew. It also is a product of the Chiu-kiang plant in Shanghai

Practical Ideas



With button

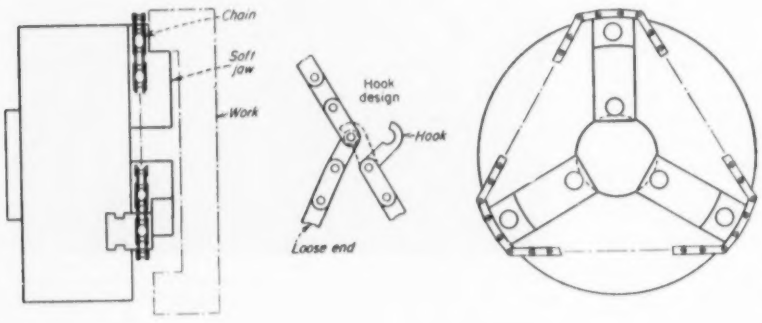
With pressure pad

Pressure Device Prevents Wobble Of Workpiece in Drill Jig

Small pump jigs are sold with the assurance that the top plate, which carries the drill bushings, will securely clamp the part. This is not always true. I have found that, even when the part was nested, drilling more than one hole produced enough wiggle to spoil the accuracy between centers.

To overcome this wiggle, I introduced a plain button having a 45° angle. This button kept the work in perfect position but there was a slight drawback as the cam raised a burr where it contacted the part. Where this mark is objectionable, I use a device which is equally effective and leaves no marks.

As the top plate descends, the hold-down point contacts the work and is forced upward against the spring. This action causes the pad to pivot and move the thrust point against the side of the work and in, toward the stop. When all of the play has been taken out of the swivel clamp, the part is securely locked. The distance between hold-down and pivot must be at least twice the distance from thrust point to pivot. This arm is necessary to overcome the friction created by hold-down. Without it, thrust is lacking to move the work against the stop. Note, also, the hole drilled horizontally under the clearance hole for the drill. This hole will collect the chips, which are readily blown away sideways. *R A Petersen, Chf Tool Eng'r, Signode Steel Strapping Co, Chicago, Ill*

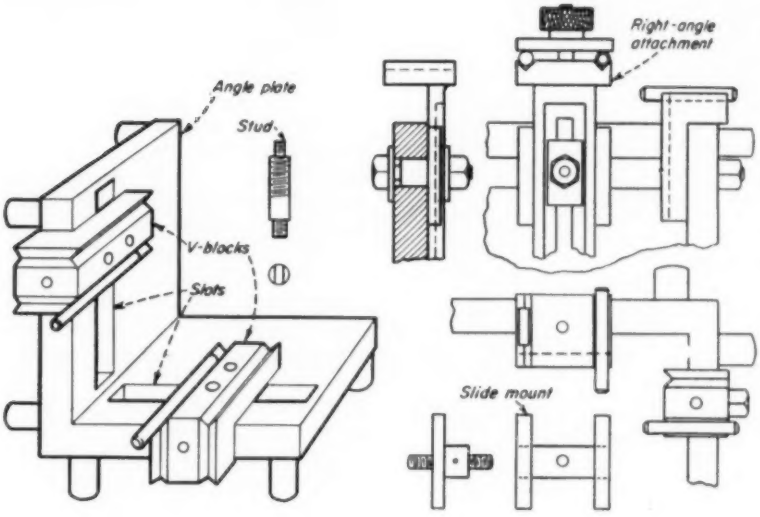


Chuck Jaws Locked for Turning With Bicycle Roller-Chain

When soft chuck jaws must be turned for concentricity prior to doing second-operation work on the lathe, they should be loaded in a manner similar to their condition when gripping the work. If they are to be used on bar or plate, a suitable washer or disk is gripped in the inner ends of the jaws so that they are pushed back to the position they will occupy when gripping the work.

Some operators make the mistake of holding a plate in the jaws when turning them prior to internally gripping the work. Thus, the jaw teeth bear on the wrong side of the scroll teeth in the chuck and the turned jaw steps are not truly centered. The conditions of internal gripping can be obtained by wrapping a sprocket chain around the outer ends of the chuck jaws, which are then tightened outward to place the chain in considerable tension. This action causes the jaws to bear on the correct portion of the chuck scroll for true running of the work gripped by them.

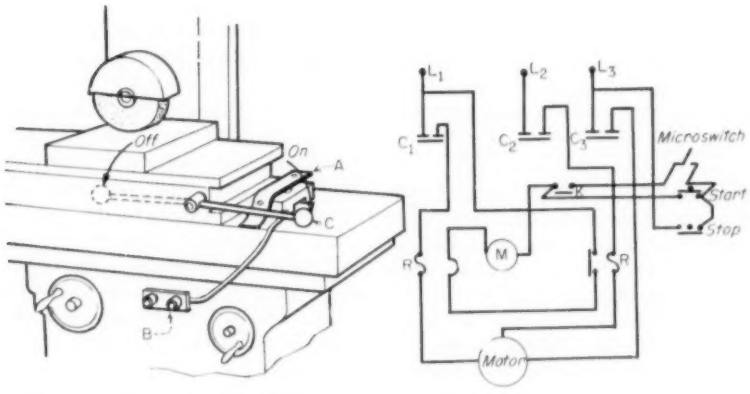
The chain is readily adjustable for length and is extremely strong. One of its ends is fitted with a hook which will engage with any suitable roller to determine the length. The loose end of chain is tied with wire or string to prevent it from flying out. A length of roller-chain, kept in the toolbox, is useful for many holding jobs. *Clifford T Bower, London, England*



Angle Fixture Used To Inspect Complex Work

The fixture shown was designed to simplify and speed inspection of small batches of parts, such as compound levers and similar items, when it is necessary to set up on two holes (which may differ in size and location) from a given base line. The angle plate is machined to form two accurate slots and is fitted on the outside with studs to provide clearance for the clamping nuts and similar parts. The inside of the angle and two edges are then ground true. Two angular V-blocks locate gage pins in the horizontal plane and are adjustable for pitch and relative elevation. These blocks are locked in position by studs which extend through the slots. The studs are also used to clamp the gage pins, using a simple crossbar.

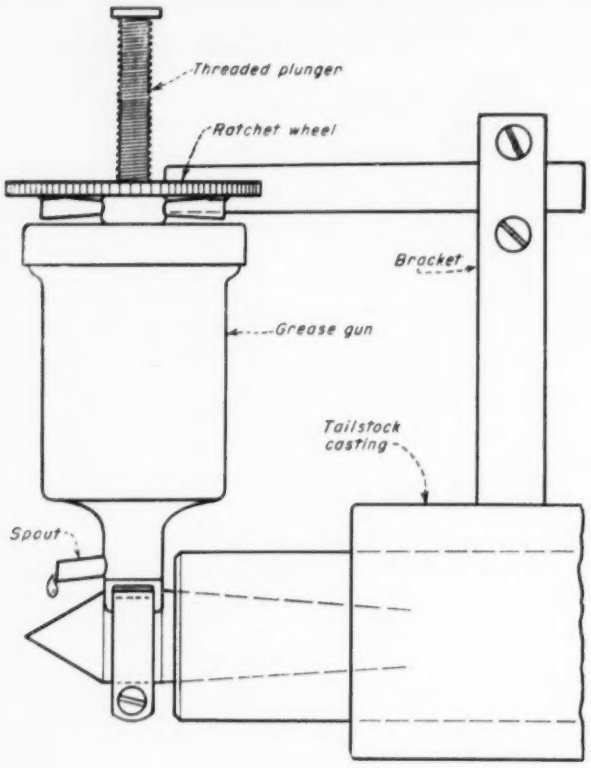
When setup holes are at right angles to each other, the special right angle attachment is used. It replaces the V-block and allows adjustment in two directions relative to the second V-block. A slide mount is provided for the special block and this part must be accurately fitted into the slots, thus keep the angle block square as it is adjusted for height. A nut is used to clamp the slide mount, using the same stud, and a nut at the opposite end fastens the block. A few tapped holes, not shown, in the top edge and in the plate face will facilitate clamping the work. *R H Fry, Croydon, England*



Magnetic-Chuck Hazard Reduced With Shop-Built Safety Circuit

In spite of all that is done to enforce the rule, "make sure work is secure before starting machine," people still insist on smashing work, wheels, and themselves by pressing the button without checking. Our particular problem was on a small plain surface grinder equipped with a 6 in. x 18 in. permanent-magnet chuck.

As is generally the case on these machines, it was possible to start the spindle motor, traverse the table, and bring the grinding wheel in contact with the workpiece without placing the magnetic chuck lever in the "on" position. This safety hazard was eliminated by a simple device consisting of a Microswitch wired in series with the spindle motor switch. The magnetic chuck operating lever, when moved to the "on" position, depressed the micro switch to complete the circuit and allow the spindle motor to be started. With the lever in the "off" position, the circuit is broken and it is impossible to start the motor. The grinder motor switch is wired in series with the Microswitch as shown. Only when the Microswitch is in the start position (magnet on) will the motor switch circuit be complete. *R M Worthington & L E Mason, Purdue University, Lafayette, Ind*



Automatic Oil Dispenser Keeps Center Lubricated

While I agree that the ball-bearing center in the tailstock has many advantages, especially at today's higher feeds and speeds, there are still times when the solid center is needed. The latter is especially valuable when the length and diameter of the body must be kept to a minimum. However, these centers must be durable and they are useless if not well lubricated. White lead with oil is hard to beat as a lubricant but it is messy and requires a lot of time to apply to large batches of small parts.

To save time and make working more pleasant, we have devised the dispenser shown. It is mounted directly on the center and is supported by the tailstock, a plain hose-clamp being used to hold the base to the center. A small spout protrudes to a point vertically above and about ¼ in. behind the sharp point. Into the reservoir we place a mixture of white lead and oil. A teacup full will last for several days.

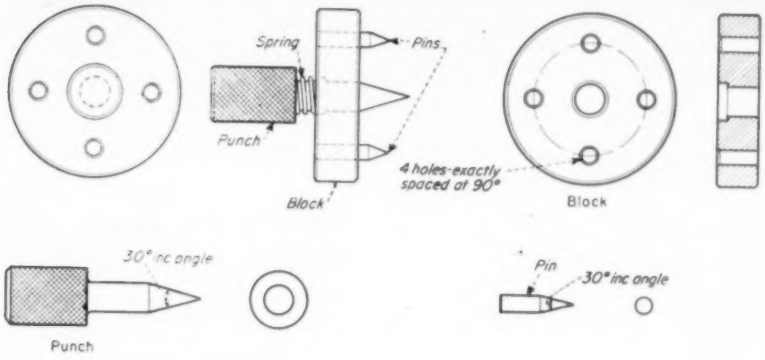
At each withdrawal of the center to unload a finished workpiece, a spring pawl clicks into a one-direction tooth on a ratchet wheel and gives the wheel a slight turn. As the wheel is attached to the screw plunger of an ordinary grease gun, the plunger is moved downward and a drop of lubricant is forced from the spout to the center. The pawl is made from a piece of clockspring and the wheel from an old milling cutter. Our grease gun is of the design that uses a spring behind the plunger so that when the screw is turned counterclockwise, the plunger forces out the lubricant. *N Palmer, Paddington, Australia*

Remove Broken Center-Drills With Quickly Made Tool

As most machinists have been plagued any number of times by a center-drill which breaks and leave the broken tip jammed tightly in the work, here is a simple way to remove the tip. With a cut-off wheel, grind a slot across the end of a broken center-drill as shown. This slot will provide two sharp cutting edges just wider apart than the diameter of the broken tip. Mount the new cutter in a chuck and bore around the tip until it is free. Then the necessary center can be redrilled by going slightly deeper with a new drill. Broken center-drills can be saved and used as removing tools and also as small milling cutters for special shapes and raised lugs. *Walter J Munch, Milwaukee, Wis*

Rivet Rolling Tool Uses Headless Setscrews

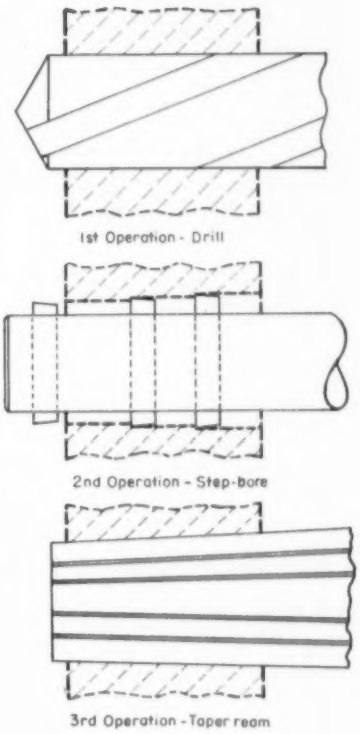
To make a rivet rolling tool in a hurry, cut a 4-in. length of round crs or drillrod. Then select a cup-point setscrew having a cup that best resembles the rivet head desired. Drill and tap the round stock to suit the setscrew thread and about ¼ to ⅜ in. deep. Insert the setscrew into the threaded hole with the slotted or socket head first, so that the cup-point sticks out about 1/16 in. This tool will do a surprisingly neat job. It is a good idea to make several tools, in different sizes, and keep them in the tool box for use as necessary. While these tools will last for a considerable time, the drillrod shank should be hardened, for longer wear, to prevent mushrooming of the hammered end. *A J Laneville, Albuquerque, New Mexico.*



Centerpunch Guide Spots Holes Within Close Tolerance

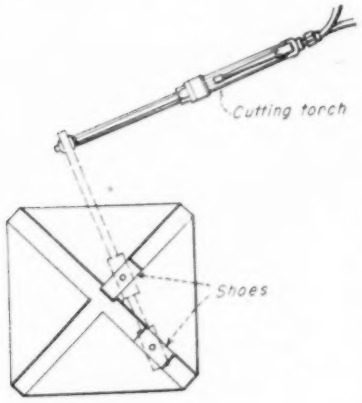
While there are many tricks for exactly locating centers for work layout, including optical locators and spotting the center with a scriber, then using the centerpunch to enlarge the indentation, I have found the device shown to be both accurate and quick.

Four points extend out of the body, locate in the cross-lines, and automatically lock the tool in position. Then the centerpunch is lightly tapped to mark the exact center of the crossed lines. I have worked within 0.001 in. at all times. By placing the points on smaller diameters, smaller work can be spotted. However, very small diameters increase the danger of error and, at all times, the points *must* be sharp and perfectly centered on the pin. Also, the tool should be made on a jig borer. *A Sciarrino, Plainedge, LI, NY*



Shoes Improve Action of Ellipse Layout Instrument

The instrument described by S F Delano for laying out ellipses is extremely useful (AM—June 8 '53, p. 182). However, a minor modification makes it more positive and reduces the danger of error.



The two pivot pins that ride in the guide slots must stay each in its own slot while describing an ellipse or an error is introduced. In the arrangement described, there is a danger of either pin entering the perpendicular slot where the slots cross. If the instrument is used simply to lay out an ellipse, little harm can be done. But, the same device can be used to guide a tool, such as an acetylene cutting torch, and a slip would result in serious damage.

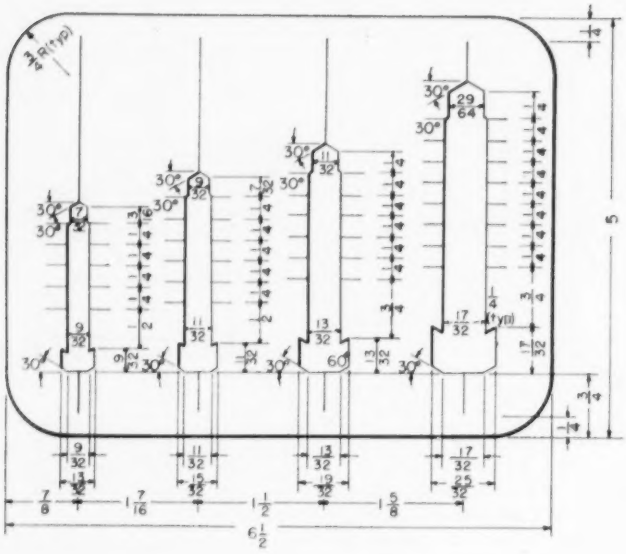
Modification is accomplished by simply sliding long shoes into the slots and providing each shoe with a hole to take the pivot pin. Thus, the longer shoe cannot enter the perpendicular slot. For a more secure and permanent tool, T-slots can be used with the pivot pins fastened into the shoes but free to pivot. *Haim Murro, Bayonne, NJ*

Step-Boring Produces Smooth Finish in Taper Holes

When large taper holes are bored, frequently it is difficult to obtain a smooth finish and accurate size. Because there is more stock to be removed at the large end of the hole, reaming from a straight drilled hole causes extreme tool wear and excessive chatter. The step-boring method shown will produce a smoother finish and will reduce the cost of tool upkeep.

The first operation consists of straight drilling to remove excess stock. Then the piece is step-bored with a round bar containing as many toolbits as are required for the depth of the hole. Each bit, from front to back, is set out slightly more than the preceding one, hence each bit removes a little more stock.

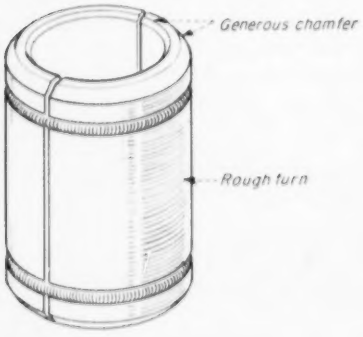
Tools must be spaced so that the steps overlap to prevent ridges. After boring, the piece should be taper-reamed for best results. *Roger Isetts, Kenosha, Wis*



Templet Speeds Drawing of Socket-Head Capscrews

When designing tools, a quick method of drawing in the many socket-head capscrews usually required is to use a templet. This templet is cut out of thin Plexiglass by using a razor blade.

Side views of capscrews are drawn by placing the centerline of the desired screw over the centerline of the drawing and following the templet outline with a pencil. Tic marks are to indicate screw length and the cross lines (chamfer, drill point, head, etc) can be traced for rough sketches or drawn with a T-square or triangle for accuracy. I have found this method faster and more accurate than using dividers. *William M Exely, Louisville, Kentucky*



Dieset Versatility Improved With Shop-Made Adapter Unit

Slip-on adapters that allow greater interchangeability between diesets with shanks of different diameters and press rams having different hole sizes are readily made in the shop. We determined the the size shank required to fit each press and the shank diameters of our dies. Then we made a set of adapters for the most useful sizes.

The adapters are turned on a lathe from steel bar stock or from steel tubing. To provide a better grip a rough finish was obtained by using a sharply pointed tool and a coarse feed. After machining the surface, grooves were turned at each end as shown, then the sleeves were slit in half on a milling machine. A small coil spring was placed in each groove to hold the halves together and to simplify handling. For longer life, the adapters were case-hardened. *Frank M Butrick, Jr, Alma, Mich*

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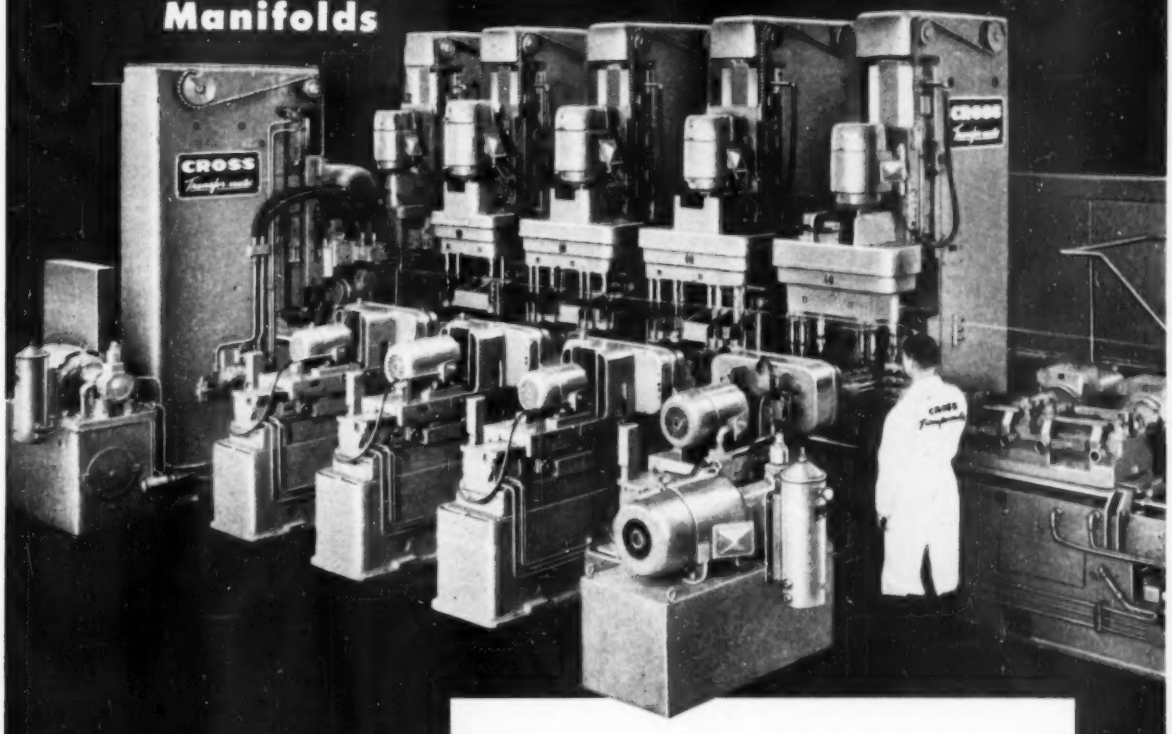
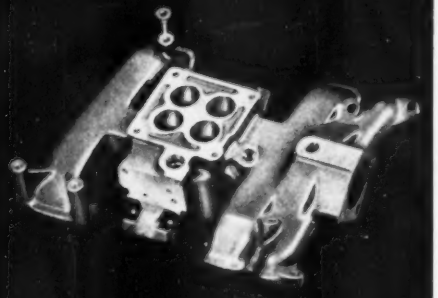
Drills, Bores, Mills, Intake Manifolds

Another Transfer-matic by Cross





★ 218 parts per hour at 100% efficiency.

★ Seven stations including loading and unloading.

★ 54 operations—22 drilling, 8 chamfering, 2 reaming, 12 tapping, 8 boring and 2 milling.

★ Two parts machined at one time in each station.

★ Palletized work holding fixtures and automatic transfer from station to station.

★ Power wrenches for automatically operating work holding fixtures.

★ Other features: Pre-set tools, built-in chip conveyor, automatic cleaning unit for removing chips from fixtures, J.I.C. Standard Construction.

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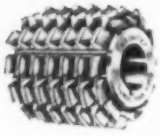

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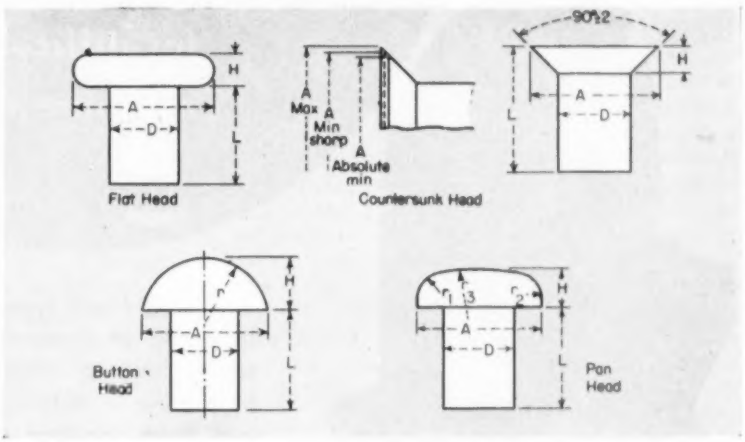
Small Solid Rivets

American Standard ASA B18.1 — 1953 published by the American Society of Mechanical Engineers, New York

BODY DIAMETER D

Nominal		Max	Min
1/16	0.063	0.065	0.060
5/32	0.094	0.096	0.090
1/8	0.125	0.127	0.121
9/32	0.156	0.158	0.152
3/16	0.188	0.191	0.182
7/32	0.219	0.222	0.213
1/4	0.250	0.253	0.244
9/32	0.281	0.285	0.273
5/16	0.313	0.317	0.305
11/32	0.344	0.348	0.336
3/8	0.375	0.380	0.365
13/32	0.406	0.411	0.396
7/16	0.438	0.443	0.428



HEAD DIMENSIONS

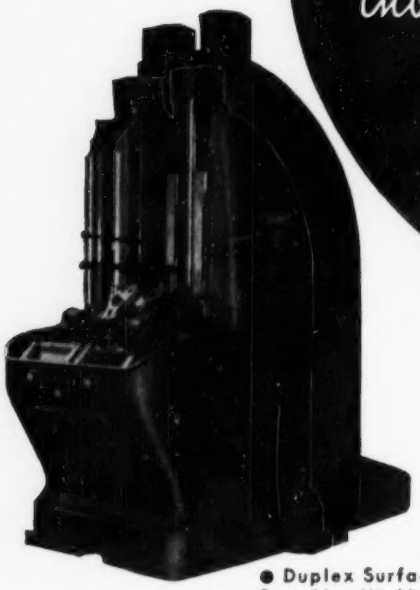
D	FLAT-HEAD RIVETS A Max	A Min	H Max	H Min	COUNTERSUNK-HEAD RIVETS A Sharp Max	A Sharp Min	A Rounded or Flat Absol Min	H
1/16	0.140	0.120	0.027	0.017	0.118	0.115	0.110	0.027
5/32	0.200	0.180	0.038	0.026	0.176	0.171	0.163	0.040
1/8	0.260	0.240	0.048	0.036	0.235	0.227	0.217	0.053
5/32	0.323	0.301	0.059	0.045	0.293	0.284	0.272	0.066
3/16	0.387	0.361	0.069	0.055	0.351	0.340	0.326	0.079
7/32	0.453	0.427	0.080	0.065	0.413	0.400	0.384	0.094
1/4	0.515	0.485	0.091	0.075	0.469	0.455	0.437	0.106
9/32	0.579	0.545	0.103	0.085	0.528	0.511	0.491	0.119
5/16	0.641	0.607	0.113	0.095	0.588	0.569	0.547	0.133
11/32	0.705	0.667	0.124	0.104	0.646	0.626	0.602	0.146
3/8	0.769	0.731	0.135	0.115	0.704	0.682	0.656	0.159
13/32	0.834	0.790	0.146	0.124	0.763	0.738	0.710	0.172
7/16	0.896	0.852	0.157	0.135	0.823	0.797	0.765	0.186

D	BUTTON-HEAD RIVETS A Max	A Min	H Max	H Min	r Approx	PAN-HEAD RIVETS A Max	A Min	H Max	H Min	r1 Approx	r2 Approx	r3 Approx
1/16	0.122	0.102	0.052	0.042	0.055	0.118	0.098	0.040	0.030	0.019	0.052	0.217
5/32	0.182	0.162	0.077	0.065	0.084	0.173	0.153	0.060	0.048	0.030	0.080	0.326
1/8	0.235	0.215	0.100	0.088	0.111	0.225	0.205	0.078	0.066	0.039	0.106	0.429
5/32	0.290	0.268	0.124	0.110	0.138	0.279	0.257	0.096	0.082	0.049	0.133	0.535
3/16	0.348	0.322	0.147	0.133	0.166	0.334	0.308	0.114	0.100	0.059	0.159	0.641
7/32	0.405	0.379	0.172	0.158	0.195	0.391	0.365	0.133	0.119	0.069	0.186	0.754
1/4	0.460	0.430	0.196	0.180	0.221	0.444	0.414	0.151	0.135	0.079	0.213	0.858
9/32	0.518	0.484	0.220	0.202	0.249	0.499	0.465	0.170	0.152	0.088	0.239	0.963
5/16	0.572	0.538	0.243	0.225	0.276	0.552	0.518	0.187	0.169	0.098	0.266	1.070
11/32	0.630	0.592	0.267	0.247	0.304	0.608	0.570	0.206	0.186	0.108	0.292	1.176
3/8	0.684	0.646	0.291	0.271	0.332	0.663	0.625	0.225	0.205	0.118	0.319	1.286
13/32	0.743	0.699	0.316	0.294	0.358	0.719	0.675	0.243	0.221	0.127	0.345	1.392
7/16	0.798	0.754	0.339	0.317	0.387	0.772	0.728	0.261	0.239	0.137	0.372	1.500

FOR HIGHER PRODUCTION

investigate...

surface broaching
for difficult
machine work



● Duplex Surface Broaching Machine. Made in 5, 10, 15, and 25 Ton Sizes.

● Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Holding fixtures are designed for quick, convenient loading. Cutting tool maintenance costs are low. We will be glad to work with you on the application of surface broaching.

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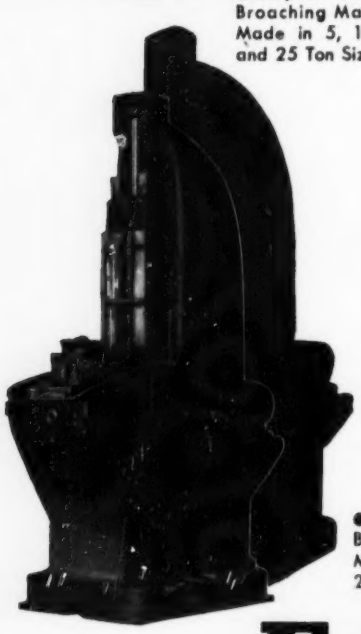


● Single Slide Surface Broaching Machine. Made in 5, 10, 15, and 25 Ton Sizes.

● Continuous Type Broaching Machine. Made in 4 Sizes.

FOOTBURT

SURFACE BROACHING

Constants for Layout of Ellipses

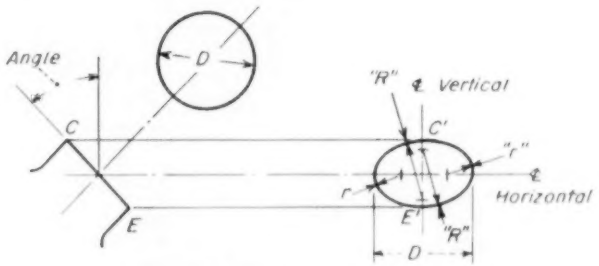
BY D E SWEET

The designer and draftsman have many occasions when they must include ellipses in drawings or layouts. If these "lopsided" circles are small enough or on a slight angle, they can be drawn conventionally. Many times, however, the ellipse must be accurately and mechanically drawn to make the drawing acceptable.

There are at least two ways to draw an ellipse. One method is to project points and connect them with a French curve. The second procedure involves using formulas to find radii R and r (see sketch). The table of constants saves the time and trouble of solving these formulas. Multiplying the diameter D by the constants for certain angles, R and r are quickly and easily determined and can be applied to the drawing.

Example—a boss or hole of diameter D is shown in one view of a drawing on an angle to the base line. Another view of this boss or hole must be drawn as an ellipse. First points C and E are projected to C' and E' on the vertical centerline and diameter D is laid off on the horizontal centerline. On the vertical centerline, two arcs of radius R are drawn, one through point C', and the other through point E'. These arcs will blend perfectly with arcs of radius r drawn on the horizontal centerline through the ends of diameter D.

APPROXIMATE METHOD TABLE FOR ELLIPSE LAYOUTS



R = Constant x D r = Constant x D

R = CONSTANT × D r = CONSTANT × D

ANGLE	CONSTANT FOR R	CONSTANT FOR r	ANGLE	CONSTANT FOR R	CONSTANT FOR r	ANGLE	CONSTANT FOR R	CONSTANT FOR r	ANGLE	CONSTANT FOR R	CONSTANT FOR r
15°	0.5088	0.4665	30°	0.5387	0.3749	45°	0.6035	0.2496	60°	0.7500	0.1250
16°	0.5101	0.4613	31°	0.5416	0.3668	46°	0.6098	0.2408	61°	0.7657	0.1174
17°	0.5114	0.4570	32°	0.5448	0.3595	47°	0.6165	0.2325	62°	0.7825	0.1097
18°	0.5128	0.4517	33°	0.5481	0.3511	48°	0.6236	0.2234	63°	0.8007	0.1030
19°	0.5144	0.4460	34°	0.5515	0.3432	49°	0.6310	0.2151	64°	0.8203	0.0959
20°	0.5160	0.4404	35°	0.5552	0.3355	50°	0.6389	0.2064	65°	0.8415	0.0890
21°	0.5177	0.4347	36°	0.5590	0.3268	51°	0.6472	0.1975	66°	0.8646	0.0826
22°	0.5196	0.4292	37°	0.5630	0.3184	52°	0.6560	0.1888	67°	0.8898	0.0762
23°	0.5213	0.4232	38°	0.5672	0.3105	53°	0.6654	0.1812	68°	0.9174	0.0699
24°	0.5236	0.4163	39°	0.5717	0.3015	54°	0.6753	0.1729	69°	0.9476	0.0641
25°	0.5258	0.4104	40°	0.5763	0.2934	55°	0.6858	0.1644	70°	0.9809	0.0585
26°	0.5381	0.4036	41°	0.5812	0.2846	56°	0.6970	0.1559	71°	1.018	0.0526
27°	0.5306	0.3965	42°	0.5864	0.2756	57°	0.7090	0.1479	72°	1.059	0.0476
28°	0.5331	0.3894	43°	0.5918	0.2668	58°	0.7218	0.1404	73°	1.105	0.0426
29°	0.5358	0.3819	44°	0.5975	0.2581	59°	0.7354	0.1323	74°	1.157	0.0376

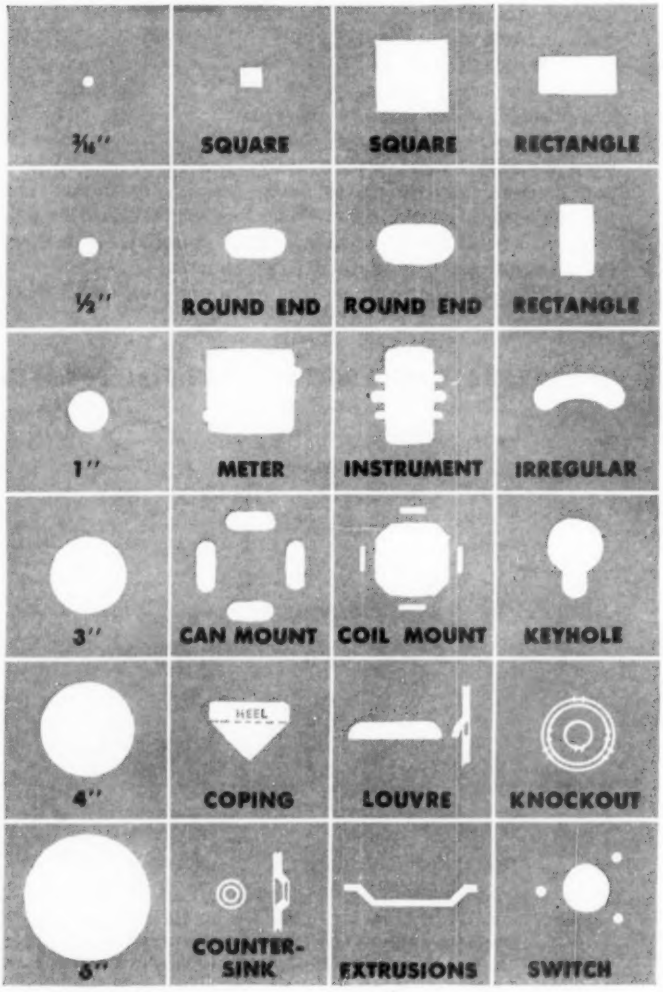
look . . .

any one of these 24 punches and dies

READY FOR USE IN 5 SECONDS

without set-up!

- Or, any selection of 12 to 32 punches and dies suited for your work.
- A Wiedemann Turret Punch Press has the tools where you want them—in the press—not on the shelf.
- In 5 seconds the operator selects the punch and die, and pierces the opening in flat sheet metal or plate.
- Any punch and die in the turret can be replaced with other sizes in less than 2 minutes.



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Eliminate Set-up
Eliminate Layout with Wiedemann Work Locating Gauges
Reduce Handling Time

We will make time studies on your work without obligation. Send prints.

Plan view of lower turret of typical Wiedemann with 18 stations.

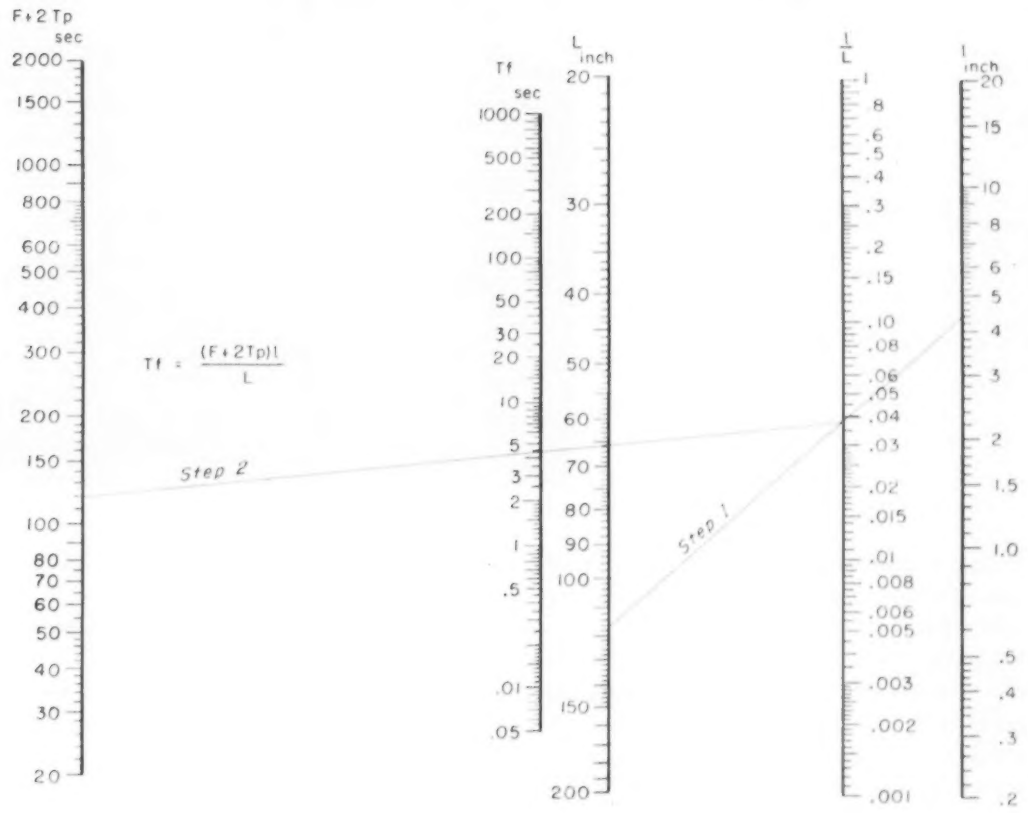
WIEDEMANN MACHINE COMPANY

4272 Wissahickon Ave., Philadelphia 32, Pa.

American Machinist REFERENCE BOOK SHEET

Time for Screw-Machine Parts

BY I ZORICH
Tool Designer, KELVINATOR LTD, South Australia



Time to produce a part on automatics is:

$$T_a = T_p + T_m + T_f$$

where: T_p = production or cycle time, sec.; T_m = machine allowance for personal needs, tool sharpening, etc; and T_f = time to feed bar into machine, sec.

$$T_f = (F + 2T_p)\ l + L$$

where F = Time to insert bar in machine, sec.; l = length of part plus cut-off and facing allowance, in.; L = length of bar minus end scrap, in. Some leading European firms use values of T_m and F, as given in adjoining columns.

EXAMPLE: F = 60 sec.; T_p = 30 sec.; l = 4½ in.; L = 120 − 2 = 118 in. (2 in. scrap end); Then $F + 2T_p = 60 + 2 \times 30 = 120$ sec. Connect 118 on L scale with 4½ on l scale. Then from 118 on $F + 2T_p$ scale draw line to intersection of first line with the L/l scale. Then T_f is read as 4.5 sec.

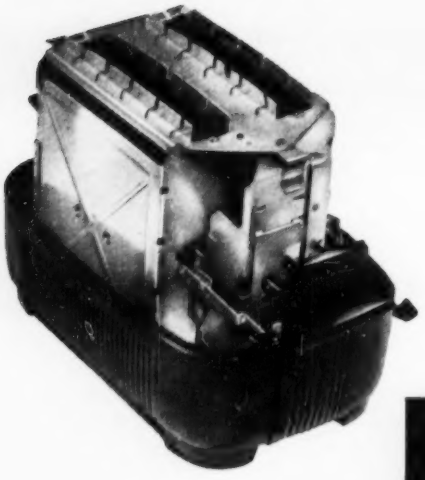
When using this nomogram for turret lathes, use $F + T_{p_o}$ instead of $F + 2T_p$, where T_{p_o} = time for cutting off only the first part from bar.

VALUES FOR T_m

B & S, BSA & CVA automatics	14% of T_p
Cleveland automatics	15% of T_p
4-Spindle automatics	16% of T_p
5-Spindle automatics	17% of T_p
6-Spindle automatics	18% of T_p
8-Spindle automatics	20% of T_p
Swiss type, guide-bush work	22% of T_p

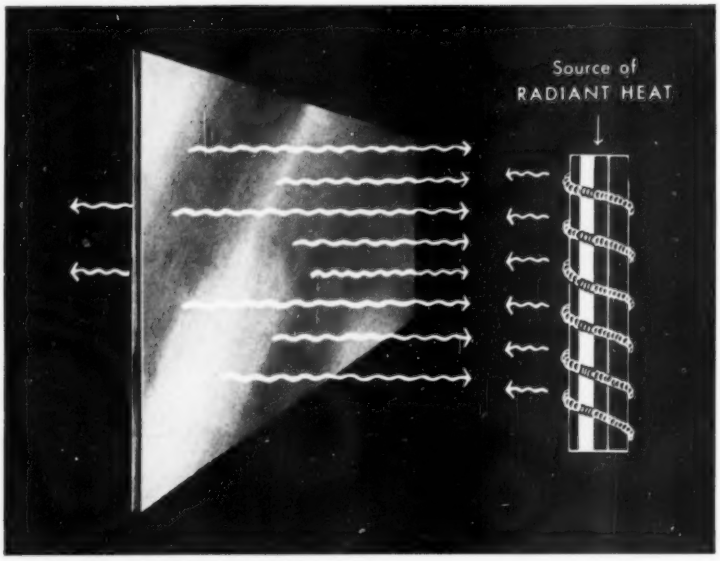
VALUES FOR F

Automatics	Rounds	Sq. or Hex
Single-spindle to ¾ in.	30	40
" " ¾ - 1½ in.	40	50
Multi-spindle to ¾ in.	50	60
" " ¾ - 1½	60	75
Swiss	60	75



This ALUMINIZED Steel interior of a toaster keeps the inside hot, the outside cool.

This Steel STOPS Radiant Heat



Armco ALUMINIZED* Steel is an effective heat *barrier* because it is an excellent heat *reflector*. Up to about 900 F, it reflects more than 80 per cent of the radiant heat thrown against it. Less than 20 per cent goes through this hot-dip aluminum-coated steel. That's why it raises the heating efficiency of infra-red ovens, ranges and other gas and electric appliances. It *contains* rather than dissipates the radiant heat.

ENDURES SCALING TEMPERATURES

Besides serving as a reflector of heat, Armco ALUMINIZED Steel is widely used where high temperatures would cause other low-carbon steels to fail through progressive scaling. ALUMINIZED will withstand temperatures up to approximately 900 F without discoloration, and up to about 1250 F without destructive scaling.

For this reason a prominent independent research laboratory has rated Armco ALUMINIZED Steel next to stainless steel for endurance in combustion chambers and burner rings of gas-fired furnaces.

A FLAT-ROLLED PRODUCT

Armco ALUMINIZED Steel is made in sheets and coils 12 through 28 gage in thickness and up to 36 and 48 inches in width depending on gage. For more information on this versatile material, write for the booklet, "Armco ALUMINIZED Steel".

For other Armco products see our catalog in Sweet's Product Design File.

ARMCO STEEL CORPORATION

4463 CURTIS ST., MIDDLETOWN, O. • EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

U. S. PATENT OFFICE

TALKING SHOP

Black 'n White, Please

MULTI-TOOL SETUPS with both tracer-contouring and a wide form-tool complicate selection of proper coolant for both types of cut. One answer is to use the coolant system for contouring, and, as the last operation, plunge-cut with the form-tool, brushing on heavy sulfurized oil. Prompt unchucking keeps the heavy oil out of the sump.

Salt Cuts Paint

ONE MANUFACTURER of painted parts has been puzzling out a way to clean the hooks which carry these parts past the paint line. Up to 30 or more coats of paint had to be removed. Various ways had been tried, such as burning, which was messy and inconvenient; and acid pickling, which left hand work in scraping last bits of paint. Now hooks are put through an electrolytic salt bath (the type often used for descaling of metals). Hooks come out cleaner, and cleaning time per hook has dropped from 3 or 4 min to 10 or 15 seconds.

Plenty of Suction

Spin-testing of aircraft jet turbine shafts was giving one manufacturer plenty of trouble. The vacuum in the spin-test pit was only about 29.5 in. Hg, so the turbine shaft wouldn't reach quite the required rpm. After intensive study of the equipment (instruction manual in hand), the engineering department decided the oil should be changed. A hurry-up order got the new oil, and the change was made. No improvement. Finally it was discovered that there were unnoticeably small leaks all through the system. After a complete overhaul of the seals, the vacuum was increased and all was well.

Competition

THE HORSELESS CARRIAGE with a 1-lung gasoline engine started a revolution—and moved the auto capital to Detroit 50 years ago. The eastern firms bet on steam and electric cars and a high-priced market; they failed, but they did contribute many new ideas. Since 1899, one of every six inventions listed in the U S Patent Office has been automotive. Recently, 8000 patents a year have been automotive.

Many gadgets were once accessories, now are standard equipment. Cases in point are windshield wipers, self starters, closed bodies, balloon tires, safety glass, 4-wheel hydraulic brakes, all-steel bodies, sealed-beam headlights, and shock absorbers.

Slug-Rob-Sleep

THREE aircraft machinists from Canada recently hit New York City on a sightseeing tour. To stretch their funds, they slept in their car. The second night they were pulled from the car, beaten and robbed of car and $142. The car was soon recovered and the Canadian Consulate advanced a little money. Then Mack Boettger, who owns a sheet-metal plant in Long Island City, invited the boys to be his guests for a weekend. So all's well that ends well.

Screw-Machine Marker

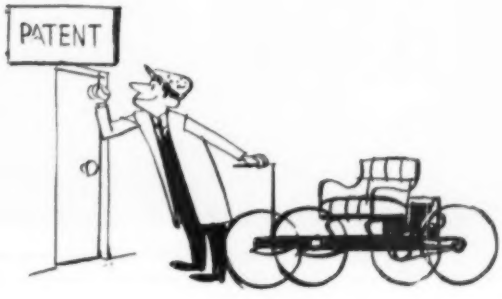
MANUAL MARKING was eliminated on a thin-flanged service part for Ford by installing an automatic marking device in the tailstock of a Conomatic 6-spindle automatic screw machine at station 5. The marking device, recently developed by New Method Steel Stamps, Inc, Detroit, advances, stamps a trade mark and identification numbers, retracts and automatically resets ready for the next part—all during the machine cycle. A total of six job-lots of 6,900 parts each were marked with different identification numbers with a single marking unit by interchanging standard dies at the end of each production run. Selection of marking radius for each lot was made possible by the adjustable roll die-holder head which is mounted on dovetailed ways.

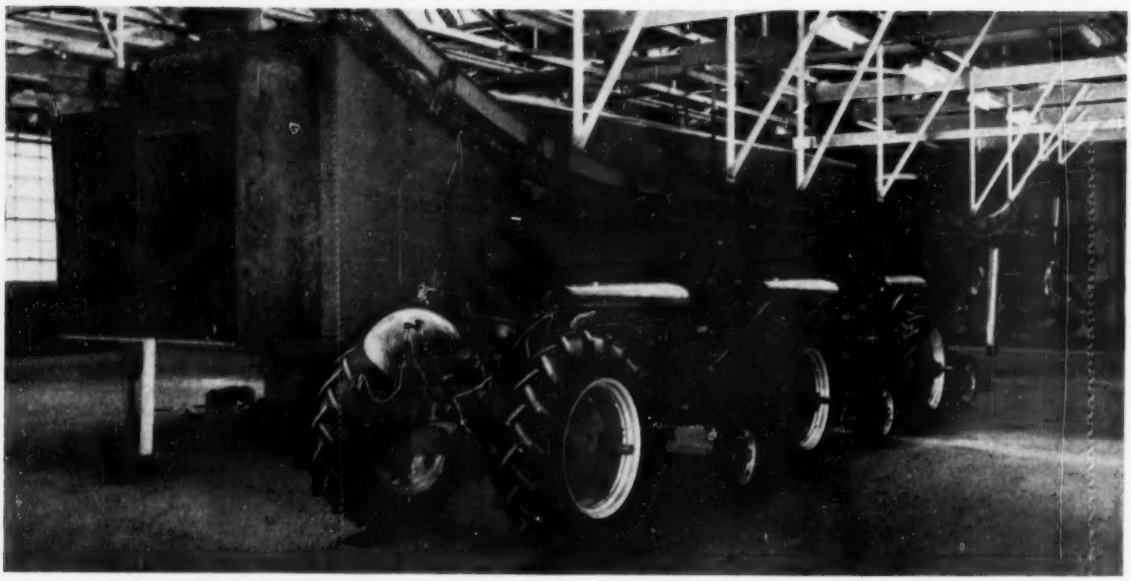
Horseless Carriage

GENERAL MOTORS, in observing the 60th anniversary of the automobile this month, points out that Europe lead in auto production until 1906, but application of mass-production machinery around 1901 gave American plants the lead after '06. Even in 1910, Europe was still using hand tools, believing that the market was so limited that overproduction was imminent.

Our production of autos in 1896 (steam and electric) was 25, in '99 it was almost 4000. By '04 we made 23,000. By 1916, some 1000 companies had entered the field, but only about 140 remained. Recent entries include one in 1925, one in 1939, one in 1945. In 1948, more than 20 companies were preparing to build and sell cars, but only one ever got into production.

In all, over 1500 companies have produced more than 2500 different makes, but by 1948, there were only 56 companies, producing 21 makes of passenger cars, 39 of truck and 20 makes of motor buses. Remember the Jordan, Carbon, Case, Chalmers, Dixie, Ajax, Astra, Ben-Hur, Betz, Stanley Steamer?





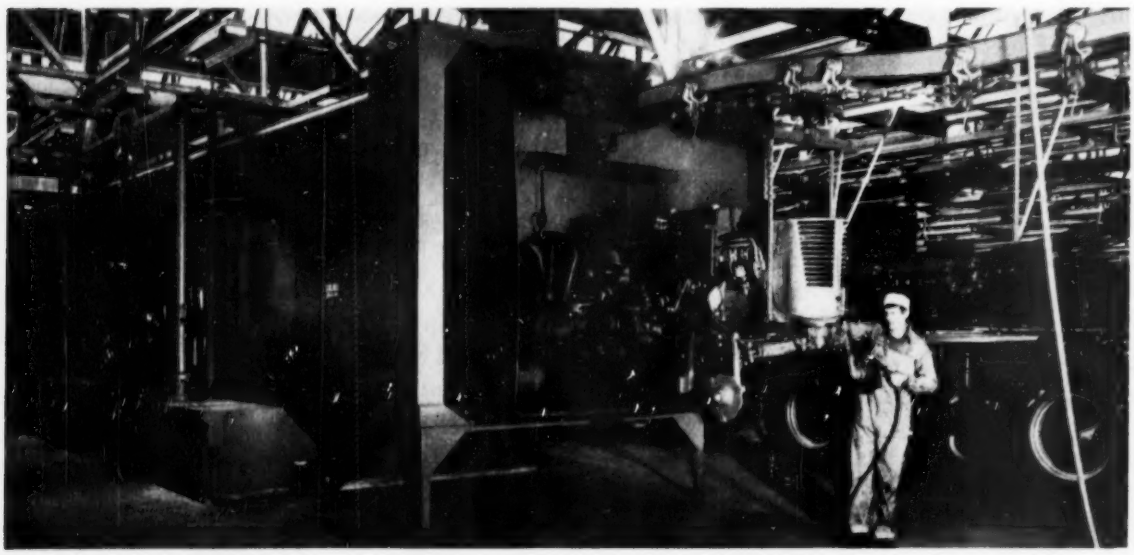
1 **THREE FINISHED TRACTORS,** driven off the line as in an auto plant, are parked close to the conveyor loading point where they started through the paint cycle. Minus hood, wheels, and some smaller parts, each tractor. . . .

TRACTOR FINISHING TAKES THE AUTOMOTIVE

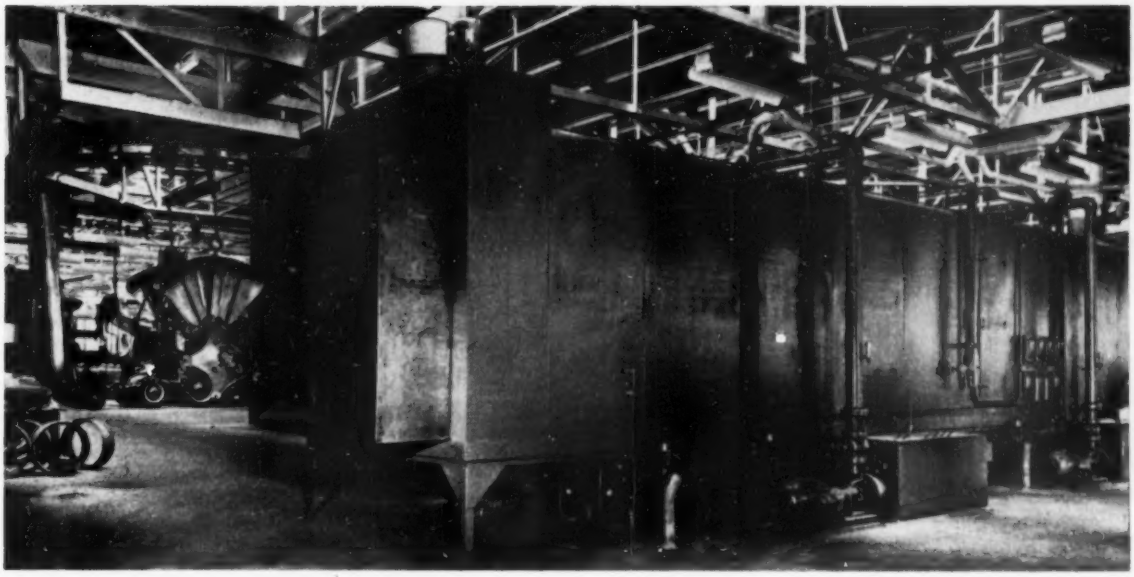
A new plant can make a whale of a difference in an assembly operation, and a tractor-finishing plant is no different in this respect from an auto plant. Case's new Rock Island factory takes up only 260 x 60 ft, but it has doubled output of VA-series tractors to 95 per 8-hr day, or one every five minutes.

The installation was made by Despatch Oven Co in collaboration with Case engineers. Focal points of the system are the cleaning, painting, and drying sections, which replace a 16-year-old system that included a pusher conveyor, hand steam wash, tunnel spray booth, and open-air drying.

The 600-ft continuous conveyor operates at from 1½ to 4½ fpm, carrying nearly-assembled tractors



3 **EACH UNIT IS BLOWN DRY** by large-air-volume fans and man-operated air hose that gets corners and crannies. Masking for paint application is handled past drying area, from which tractors are conveyed to. . . .



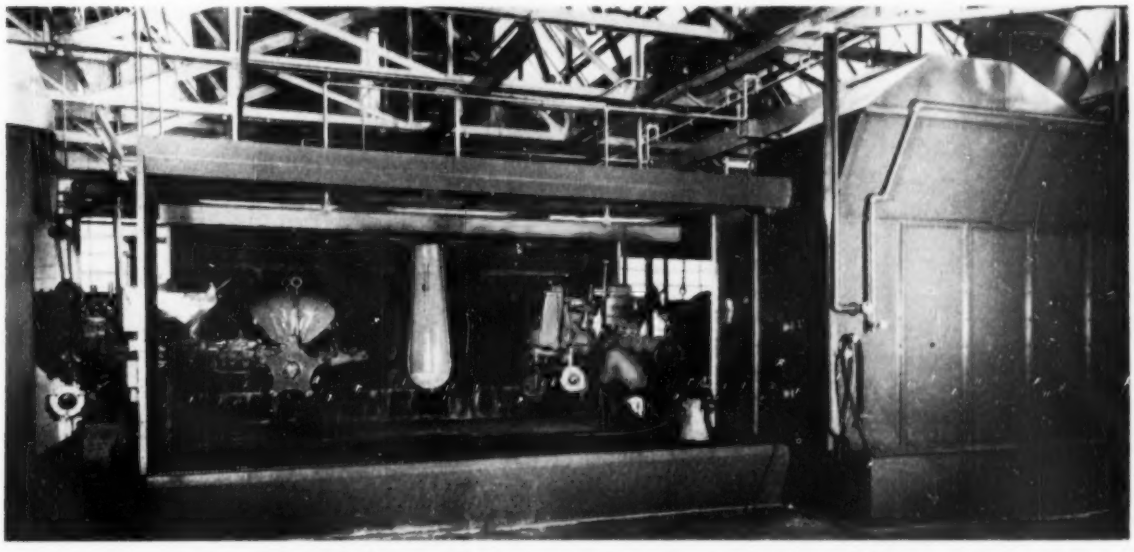
2 **ENTERS THREE-STAGE WASHER** with hood slung on overhead chain conveyor behind it. First stage is all-angle phosphate-solution spray; second is cold-water mist bath; third is hot (180F) water rinse. On its way out. . . .

ROAD **J I Case Co is operating a cleaning, painting, drying, and final-assembly plant that compares favorably with auto lines. Savings and improved quality of the show-room finish are the results**

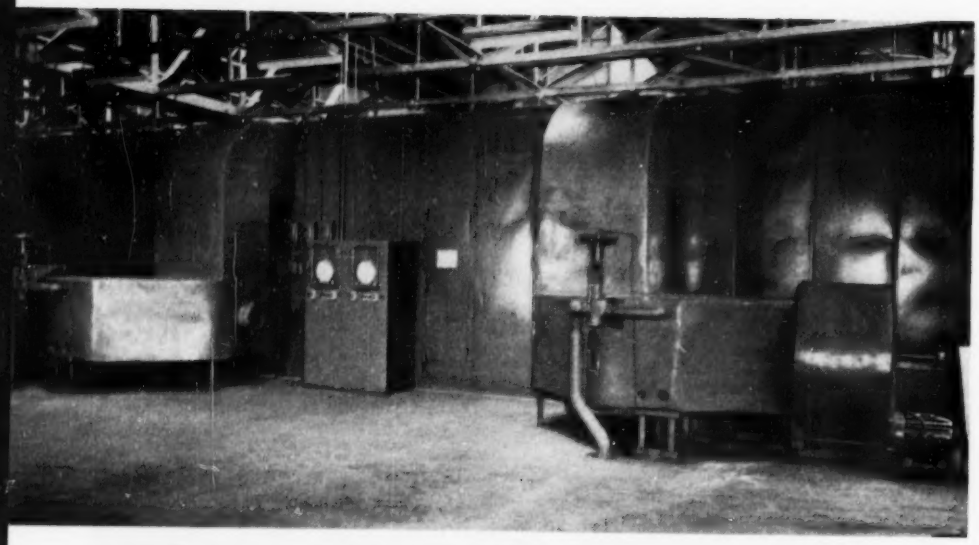
delivered from the production shop. Each tractor goes through the complete finishing cycle on the conveyor, and is not lowered to the floor until assembly has been completed.

A number of parts are added to a tractor after painting and drying have been done. These include the hood, tires and rims, generator, starter, battery, lights, steering wheel, mufflers, oil and grease, and gasoline; plus a few other smaller parts. Thus, the tractor can be driven away from the end of the line.

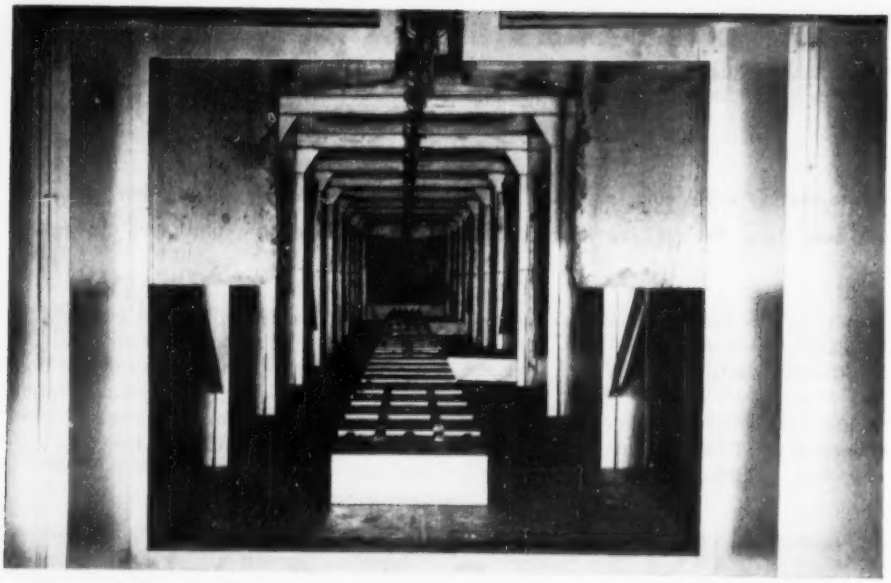
Results of the new finishing system include a much better paint job—which is held to a thickness of from 1½ to 2¼ thousandths—in addition to large savings in paint, labor, and time.



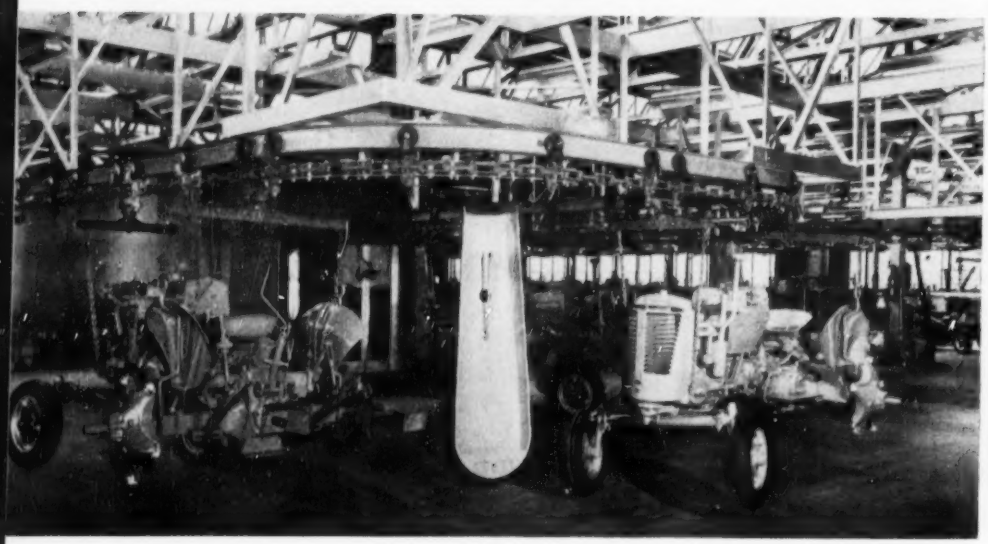
4 **TWO SPRAY BOOTHS**, each fitted with water curtains and air-control setup which keep area clean and safe. Paint-overspray recovery is almost 100%. Paint is sprayed hot (170F), and hardens in. . . .



5 **96-ft BAKE OVEN** that operates at 225F. Circulated air is heated by steam from plant's central system. Each tractor gets about two gallons of paint, which dries to weatherproof coating. Actual heating is 86 ft long because. . . .

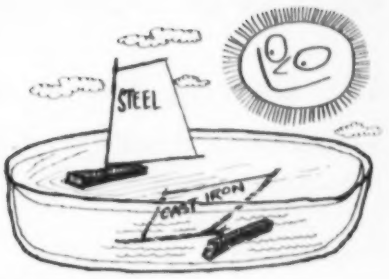


6 **ENTERING VESTIBULE IS 5 FT LONG,** leaving cell is 8 ft long. Total time inside oven is 20 min. Post oven. . . .



7 **TIRES, HOOD, STEERING WHEEL,** and small parts are assembled, and ignition system for each tractor is installed. Next—driveaway

Mercury and Magnetism Identify Mixed Carbide Blanks



Mercury floats steel-cutting grades, but allows cast-iron grades to sink.

Stronger magnetic pull differentiates softer, tougher grades from harder ones

BY CARROLL EDGAR, Carbide Engineer, LAPOINTE MACHINE TOOL COMPANY

Frequently, production shops encounter the problem of untangling mixed-up grades and brands of carbide blanks. Manufacturers customarily ink-stamp the exact grade designation on each blank, so mistakes are seldom made in proper identification initially. However, it often happens — by error or by handling—that blanks for steel cutting will be mixed up with blanks for non-ferrous cutting. When this occurs, a tool fabricator is confronted with a real problem. If he takes a chance, his guess will be wrong more often than not. A steel grade cutting cast iron will abrade excessively, while a cast-iron grade cutting steel will show rapid cratering. Chance-taking on large lots of tools or very important and expensive work-pieces can be disastrous.

Heretofore, one had to send samples to his source of supply for analysis and check. This is a time-consuming procedure: to take photomicrographs, make chemical analysis, or use the spectrograph and x-ray diffraction tests.

TO SEPARATE GRADES

Some years ago, I discovered an almost (if not entirely) infallible, quick field test for separating various grades of unidentified cemented-carbide blanks.

The blanks must be strictly cemented carbide and free from brazing material or noticeable foreign matter. If braze material is on the blanks, grind it off or remove it chemically. Grinding is faster for the purpose.

Procure a small jar of mercury. It costs about $6 a pound—however, ¼ lb would serve satisfactorily for the bulk of this type of check. Mercury is poison when taken internally. It should not be handled so as to get on one's skin or in one's hands. Put it in a deep saucer or a half-pint milk bottle, and label it *POISON*.

With a pair of tweezers or a hook of bent steel wire, immerse the unknown blank in the mercury. If it FLOATS, it is a steel-cutting grade. If it SINKS, it is for cast iron or the non-ferrous cutting group. This INSTANTLY tells in which of the two groups it properly belongs.

Mercury has a density of 13.55. Even though carbides are in many different grades, it happens that all the steel grades are less than 13.55, hence they FLOAT in mercury. The non-steel grades of carbides are mostly straight tungsten carbide and cobalt. This combination is heavier than 13.55, therefore, they SINK in mercury.

TO CHECK HARDNESS

It is simple matter to check the hardness on a Rockwell "A" testing machine, to determine whether a blank is for roughing, semi-finishing, or finishing.

Suppose, on the other hand, you do not have a Rockwell tester. There is another method for hardness testing that, with a little care and practice, can be made very simple. Procure a fairly strong permanent magnet, such as No. 5 Alnico, made by General Electric Company. With grades of known hardness as standards, compare the "pull" of the unknown carbide blank with each of the known grades, consecutively. Judge by comparative "pull."

Cobalt is common to all cutting grades of cemented carbide, and drawing dies as well. Cobalt is magnetic. This element is used as a cement or binder for holding together the small particles of carbide. As such, the percentages used range from about a minimum of 3 to a maximum of 17. A "hard" grade has the least cobalt binder, and a "soft" grade has the most, depending upon the purpose for which the grade has been made. For example, for shock cuts (such as interrupted or roughing cuts), a "soft" or "tough" grade is used, while harder ones are used progressively for average cuts to the fast, light finishing cuts. This explains the purpose of varying percentages of cobalt.

Little cobalt means slight magnetic "pull", hence a hard grade. Conversely, a fairly strong pull is interpreted as a "softer" or "tougher" grade. By "feel", in comparison to known grades, one may come extremely close to picking the exact hardness of any cemented-carbide blank. A little practice will soon develop proficiency.

SEPARATING BRANDS

Singularly enough, it is almost possible to pick the exact "brand" of carbide, because scarcely any chart of the different hardnesses of each manufacturer's grades shows exactly identical hardness for a particular job.

News of Metalworking

The Detroit Scene: Auto Makers Tool Up for Toughest Market Competition Since Prewar Years

DETROIT — Outlook for 1954 and 1955 indicates that while the auto business may not boom as it did in 1950 or other peak years, it certainly will be healthy.

Machine tool makers particularly can expect some king-size orders out of Detroit. Auto plans over the next two years call for introduction of several new engines, extensive body restyling and at least one new automatic transmission.

Sales predictions agree that average annual sales will run about 5-million cars.

The 5-million estimate will be well under 1953's market. Best estimate at this time is that about 5.6-million new cars will be sold this year. That is down somewhat from earlier predictions of 6-million or more car sales. But several production barriers cropped up, among them a severe supplier strike and the G-M fire.

GM Fire Effects

Just what effects the disastrous fire at GM's Hydra-Matic plant will have cannot be determined exactly as yet. Even though remedial measures may keep some makers in production longer than was initially believed, it appears likely that the fire will reduce sales by perhaps 100,000 units. Dollarwise, that could mean for the factories a gross sales loss of roughly $250-million. It means, too, that GM's hopes of achieving a sales volume of $9-billion this year, along with 48 percent of the entire auto market, are out the window.

The fire cast a haze over 1954 model introduction dates, but exceptional efforts on the part of the seven Hydra-Matic users may get the '54 models out on schedule, even though some may be equipped with alien transmissions.

Lincoln, which ran out of Hydra-Matics the first week in September, plans to put its '54 models in dealers showrooms by mid-December. That date may still be achieved, but Lincoln may not be available with Hydra-Matic in volume for a month or two after introduction.

Meanwhile, Lincoln reportedly is tooling up to use Merc-O-Matic transmissions as a stop-gap. And, while Lincoln production is halted, Mercury output will be increased.

Hudson First Out

Hudson is leading the new model parade, coming out in mid-September. Presumably this company has a fair stockpile of transmissions. Normally, it equips about 53% of its cars with Hydra-Matic. Reports indicate that Hudson is dickering with Borg-Warner to supply it with the transmissions used also by Studebaker. Packard, too, has been approached by car makers interested in buying Ultramatic transmissions.

Nash and Kaiser have been shut down or are on such limited production this summer that the Hydra-Matic famine is not apt to throw their plans too much out of line.

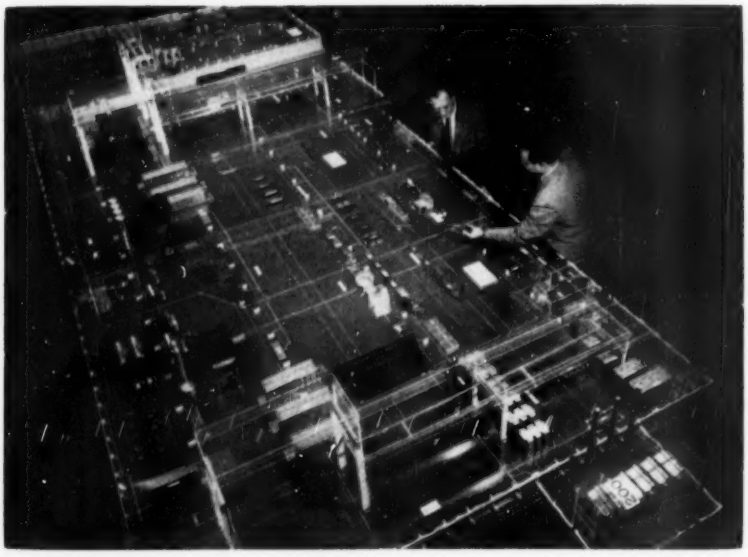
How much of Cadillac's business will be picked up by Chrysler and Packard is problematical. Cadillac customers, accustomed to waiting for

Alcoa's Scale Model Press Plant Gives

CLEVELAND—Shop men are being given a chance to design Aluminum Co of America's new Air Force Heavy Press Program plant to be built here. A ¼-in. scale model of the huge plant, built at a cost of $6500, enables supervisors, foremen and workmen to visualize the plant's layout and make suggestions for improvement.

The plant is built around two giant (35,000 and 50,000-ton) forging presses and the auxiliary equipment is of corresponding size. Thus through use of the model, the knowledge of shop men could be drawn upon in planning plant layout and in placing of equipment to avoid expensive readjustment of machines and equipment later on.

Model has floor grid lines to represent 1 sq ft of space and floor is marked off to show where sewers, water and air lines will go. At several locations on the model, cross sections are built up to show vertical clearances in the building.



SCALE MODEL (¼ in./ft) of Alcoa heavy press plant. Die shop is at rear. At left center are 35,000 and 50,000-ton presses with billet heating furnaces and trim presses. At right are finishing operations and heat treating.

their orders to be filled, will probably wait until they can get one.

Sales standings are apt to undergo as noticeable a change next year as they have in 1953. Next year unbridled competition will rule. Current jockeying heralds that. Chevrolet, Ford, Plymouth, Buick and Pontiac have held firmly to their production and sales niches. Below them, there have been notable jugglings and more will take place because of the GM fire.

But don't expect price reductions to amount to any more than perhaps a few token cuts in the $10-$50 range. Steel price increases and higher labor costs sliced into profits.

The Labor Situation

Labor costs should remain relatively constant, discounting further cost-of-living bonuses and annual improvement raises. Labor unions, now faced with layoffs among members because of defense cutbacks, will have less heart for putting forth a new set of demands in 1954. Labor will be more plentiful next year. Defense production cut-backs and lower auto output will take some of the strain off labor demands.

With steel at last loosening up, there is little reason to anticipate cost increases in that area.

The New Models

Auto makers are now readying their '54 wares. Important changes are due for some makes, but some companies are merely facelifting.

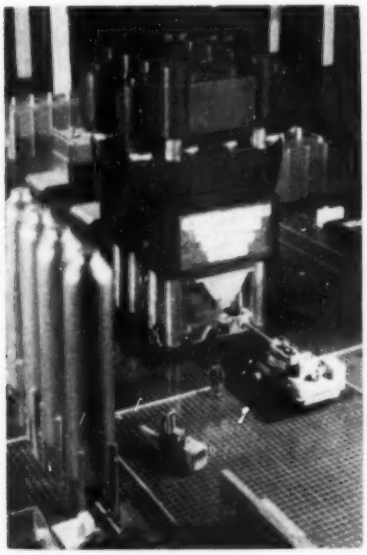
For 1954 and 1955, the following is pretty much the way companies are planning:

- **Hudson:** Got out in front of the pack with introduction in mid-September. Wasp and Hornet lines are taking on some of the styling features of the smaller Jet. Lines will be more severe. The sloping rear deck will be flattened out more along Jet lines. Glass area will be increased and divided windshields will be replaced with one-piece curved windshields. For 1955: major changes.
- **Ford, Lincoln and Mercury:** The public will see these cars in December. Little more than faceliftings will be evident, stylewise. Lincoln will resurrect its handsome Continental, embodying an upright spare tire mount and an exeptionally low silhouette. Neither Ford nor Mercury will be altered extensively. Featured will be slight grille rearrangements, more lavish use of chrome.

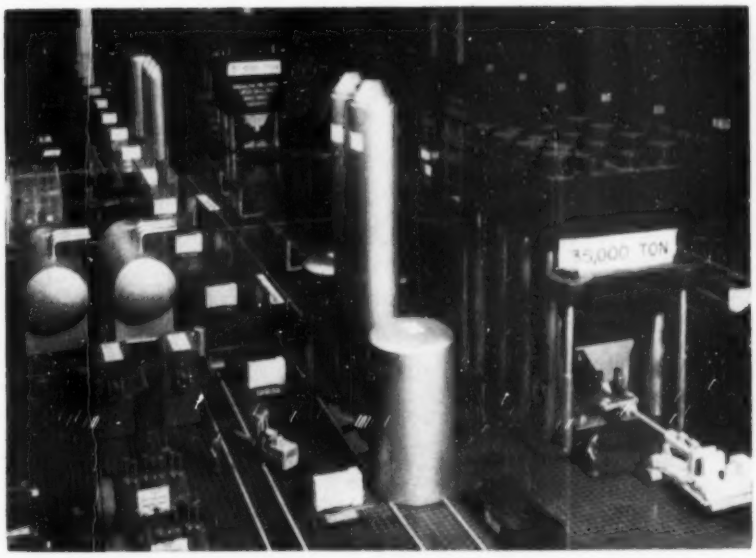
Both, however, will have new overhead valve V-8's. Ford's hp ratting will go up from 110 to 125 (10 more than Chevrolet's highest rated engine) and Mercury will go up from 125 hp to 145 hp. Lincoln's hp probably will move up to 230-240.

- **Cadillac:** Will be on the road just after the turn of the year. Cadillacs will be bigger this year—with the smaller models increasing to a size approaching that of the current Fleetwood. Cadillac will feature a wrap-around windshield. The famous rear fender fins will be modified and the fender line will be more angular. The grille will pattern after that of the LeMans. A horsepower increase is due this year.
- **Oldsmobile:** May well be the darling of the GM family this year. A new transmission suspension system reportedly permits lowering of the body 3 in. or more. Here, too, will be a new wrap-around windshield, revised grille and fenders.
- **Buick:** Like Olds and Cadillac, will be out in January sporting a new body shell. The fender line and rear fender "hump" will likely stay raised. The grille will resemble that of the Wildcat sports car prototype. Buick's V-8 (new in 1953) will be

Shop Men Voice in Plant Layout



CLOSE UP OF 50,000-TON PRESS model with forging furnaces located in background



MODELS OF 35,000 AND 50,000-TON PRESSES now being installed for the Air Force Heavy Press Program at Alcoa's Cleveland plant. Foreground are manipulator, hydraulic compressors and storage equipment for the 35,000-ton press

Metalworking Abroad

(by McGraw-Hill World News)

JAPAN—Nippei Sangyo Co plans to import a $200,000 cartridge making machine from Germany and a $50,000 French machine for manufacturing percussion caps. Provisional contracts for the units were signed by Company Vice President Hagemu Ishiwara on a recent European trip.

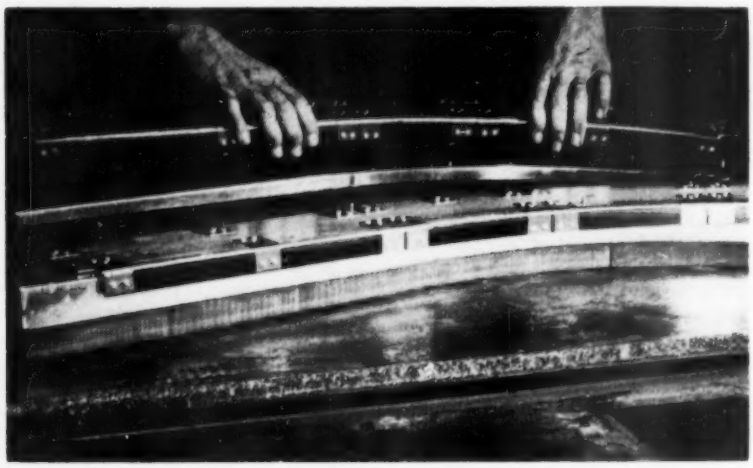
AUSTRALIA — First US-designed F-86 Sabre jet has been built here by Commonwealth Aircraft Corp. To speed Commonwealth's jet production, North American Aviation, Inc, of Los Angeles, shipped 100 sets of detailed parts, plus jigs and tooling to Commonwealth. The Australian version of the F-86 is powered by a Rolls-Royce engine slightly larger than the J-47, requiring a slightly larger diameter fuselage.

HUNGARY—The MAVAG plant is scheduled to manufacture 20 new-type oil-fired locomotives for delivery to Egypt sometime this fall.

JAPAN—Sumitomo Machinery Co, Tokyo, has been licensed to manufacture and sell Western Machinery Co's (San Francisco) line of ore-dressing and mining machinery. Agreement, reached after two years of negotiation, limits licensee to Japanese sales only.

BRAZIL — France's Berliot works plans to make a bid for the Brazilian auto market by (1) installing a parts depot at Sao Paulo to service Berliots already in Brazil and those to come; (2) manufacture of spare parts for Berliots by local automotive parts makers; and (3) eventual manufacture of heavy vehicles, principally trucks, tractors and buses, and stationary engines. Equipment and technicians have already been brought in from France. Berliot last month offered to furnish Sao Paulo's municipal bus lines with 200 90-passenger buses. Terms: four years to pay.

ITALY—Potential output of Italy's boilermaking industry is rated at 11,000 tons. But declining export markets have dropped production to where 1954 output estimate is less than 40% of that figure—most of local production going into thermal power stations and ships, and lion's share of export into 100,000 kw-plus power stations. Goal is now to produce boilers with higher elasticity and yield.



A NEW WRINKLE THAT ELIMINATES WRINKLES in hydropressed aluminum parts has already saved Temco Aircraft Corp, Dallas, $5816 this year by eliminating hand-finishing. Operator is shown holding one "over-press cover plate," and another is shown in position. Process substitutes a second trip under the hydro-press for hand-ironing with mallets. Over-press cover plate, made of .125 aluminum and shaped to conform with die top, is placed on top of the part, lying between it and the rubber press-face. Steel flanges are hinged to top plate by flexible metal attach strips riveted to rims and top plate. Rims hug sides of die and part. In second pressing, rims prevent buckling and equalize pressure, becoming in effect forming dies. Temco has made over-press plates for about 175 dies at a total cost of about $400, uses them to form aluminum weighing up to .040

THE DETROIT SCENE *continued*

extended to the Special, reports indicate. The Roadmaster V-8 produces 188 hp, the V-8 in the Super, 170 hp.

• **Pontiac and Chevrolet:** The former will stay pretty much with '53 styling, but a more prominent fender line, carrying the length of the car, will tend to give the body a lower appearance. Pontiac's V-8, developing 150 hp, will be ready for 1954. Chevrolet's will be out in 1955.

Stylewise, Chevvy will pull in its fender lines, but not to the same degree as the Corvette. The car will be "glittered up" with more chrome. Should be out in December.

• **Chrysler, Dodge, DeSoto and Plymouth:** No startling moves expected here until 1955. The '55 models will represent one of the widest departures from Chrysler Corp practices in a good many years. Long built primarily for comfort, the four makes may tend toward the lower, longer lines displayed on the Ghia experimental cars.

For 1954, Plymouth and Dodge will have 3-in. longer bodies.

Plymouth, working hard to get its V-8 into production, probably will not make it initially in 1954. Chrysler will push its hp rating up from 180 to about 235. All lines should be out before December.

• **Packard:** A facelifting here, except that the medium-priced "Clipper" series probably will be altered enough to distinguish it more clearly from other Packard lines. Packard will show its Balboa, an experimental sedan that should give some clues as to what may be expected in future styling moves. Packard will raise its hp rating to 200 or more. This company can be expected to make widespread styling changes in 1955. Probably out in mid-January.

• **Kaiser-Willys:** These cars won't be out until February, possibly March, and neither will be changed in any important respect. By 1955, however, K-W should make some important moves toward giving its cars a "one-family" look. K-W has talked about bringing a V-8 into its line. But there's little chance that this will come in with the '54 line.

• **Studebaker:** Made its big move this year. Will not alter the line appreciably for 1954, but will put the convertible back in the line. Will introduce after Jan 1.

• **Nash:** Due to make its bow in November. Pinin Farina's ideas will be more in evidence: The grille will be recessed somewhat in the manner of European cars. May introduce its small NXI sports model in 1954.

Off-Shore Procurement on Upgrade As US Balks at Direct Foreign Aid

WASHINGTON—Off-shore procurement—the buying of arms and equipment abroad—is likely to reach $1.5-billion during fiscal 1954. This is an estimate arrived at after shaking out the effects of Congressional budget cutting on this year's military and foreign aid funds.

Washington Favors It

Sentiment in Washington is behind the off-shore buying scheme. One reason: the off-shore procurement program is likely to support or subsidize NATO's most efficient industries. And the idea catching on more and more with US manufacturers.

One example of what can be accomplished: the tie-up of Raytheon Manufacturing with Microlambda Corp of Naples. While this agreement centers around manufacture of radar and other military electronic devices, the feeling is that similar licensing deals can develop a potential civilian market for television and radio sets. And what's more, if US manufacturers extend the principle to other forms of manufacturing, they are likely to develop foreign subsidiaries and foreign markets for their products. Any risk involved is likely to be assumed by the US government, which virtually underwrites off-shore procurement contracts.

The outlook for Congressional reaction to future foreign aid is poor. Letters from constituents tell US Congressmen that public sentiment is all in favor of a diminishing foreign aid program. So, Congress is likely to emphasize off-shore procurement as a means of getting out of direct economic support of foreign nations.

The main premise would be that once the US gets domestic manufacturers working with foreign companies, and gets the overseas concerns on a solid footing, the US will be able to withdraw it's economic support.

Pay-As-You-Go Aid

Even President Eisenhower is behind the program to get foreign manufacturers to turn out arms for NATO. That's why Congressional attention is likely to be turned to off-shore procurement as a test of European intent. If the scheme works out, it will provide Congress with the means to shift from direct economic grants to a kind of pay-as-you-go basis for arms aid that promises an end to dollar support.

AIR FORCE CUTS 1000 PLANES FROM QUOTA

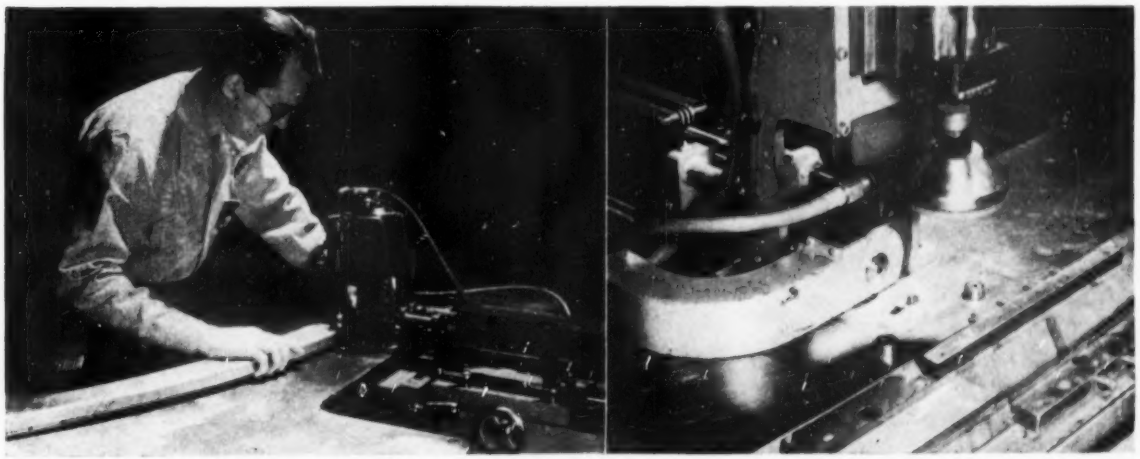
WASHINGTON — The Air Force has notified aircraft manufacturers that nearly 1000 planes are being dropped from the tail end of production schedules. This adds up to a reduction of a billion dollars or more in the current backlog on aircraft producers' books.

Despite the reductions, manufacturers won't feel the cuts for at least 18 months or two years. Reason is that plane contracts weren't terminated on a wholesale basis. The move was generally a shaving of numbers called for under present production schedules.

Reason for the cutback, according to the Pentagon, is the end of combat, and reduced training needs. Informed sources believe that the Air Force will not let the procurement funds lapse but will transfer them to other contracts calling for newer and faster aircraft—principally F-100 to F-105 fighters and fighter bombers.

Actually, with the shooting war stopped, pressure is off the Air Force to keep turning out combat-ready planes right now. So, the Air Force can swing to production of later types that may require additional modifications before they are ready for combat.

Cutbacks include 169 Boeing B-47 medium bombers; 579 Republic F-84 and North American F-86 fighter-bombers; 201 training planes and 10 helicopters.



LOCATING AND DRILLING 180 PILOT HOLES A MINUTE is accomplished with this index drilling machine at Boeing Airplane Co's Wichita, Kan, plant. Unit is reported to save 78% in man hours, drilling all necessary rivet holes for a B-47 Stratojet structural part in 1 min, where hand drilling formerly required 7.47 man min. Part is placed on an index tool. Coordination hole is slipped over pin on tool. As part and tool are hand fed, index pins engage cycling mechanism on machine. Then (1), part and tool are positioned for drilling, (2) clamped, (3) hole is drilled, (4) locating mechanism is withdrawn, and (5) tool and part are released and move forward to engage next index pin

Business Items

Deluxe Saw & Tool Co, a Rockwell Mfg Co subsidiary, has transferred its national headquarters and out-of-state manufacturing facilities from Chicago and Columbus to High Point, NC. Deluxe's Chicago plant will be maintained as a service and repair center.

United States Diamond Wheel Co has completed its new functional structural-brick-and-glass plant at Aurora, Ill,—one of the most modern in the diamond wheel industry.

Parks & Green Co, 396 Broadway, New York City, a new firm formed by Oliver J Green and Robert Parks, will specialize in screw machine and production tooling sales and will represent **Empire Tool Co,** Detroit, in the Metropolitan New York area.

Simmons Machine Tool Corp, Albany, N Y, has been named exclusive export sales agency for **Ace-Central States Machine Tool Co,** Detroit builders and designers of complete manufacturing units, including automation equipment, large jigs, fixtures and supporting tools.

Motch & Merryweather, Cleveland machine-tool manufacturers, will soon manufacture and market a power unit and a series of garden and lawn implements. "Triple M" power unit will have interchangeable implements — mower, tiller, mulcher, snow-thrower, etc.

ODM Replaces Labor-Surplus-Area Policy With Watered-Down Version

WASHINGTON — Government has put a stop to the controversial "labor surplus areas" policy under which industries in those areas were allowed to match low bids made by other companies for Defense Department business—and take the order away from them. Among other things, machine-tool orders have been switched through this procedure, and hard goods contracts have made up a good share of total defense orders placed in distressed areas.

Since the policy became effective in March 1952, more than $53.5 million in contracts have been placed in accord with its provisions, with 56% going to small companies. Generally, small business accounts for only 13% of Defense Department procurement.

Mounting protests from original low bidders and their Congressmen have resulted in a Pentagon order to halt the program.

But ODM boss Arthur Flemming is now working up a more politically-palatable scheme to do the same thing: Bid-matching will be tossed out, and with it the practice of taking contracts from one company and giving them to another. Instead, any big procurement program will be chopped in two—the bulk to be awarded by negotiation or competitive bidding, and the remainder to be set aside for labor-surplus-area firms.

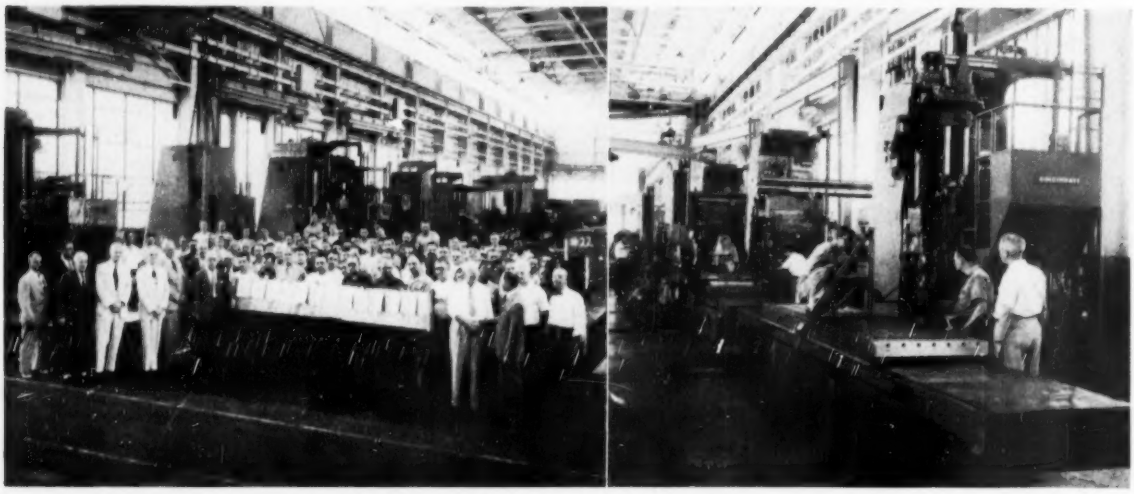
The first part of the total procurement will be let to lowest bidders. Then surplus-area contractors who meet the low bid will be awarded contracts for the set-aside portion of the program.

There's bound to be opposition even to this plan. But advocates are ready to bring the issue directly to the President on grounds that he pledged preference on defense contracts for distressed areas in a campaign speech.

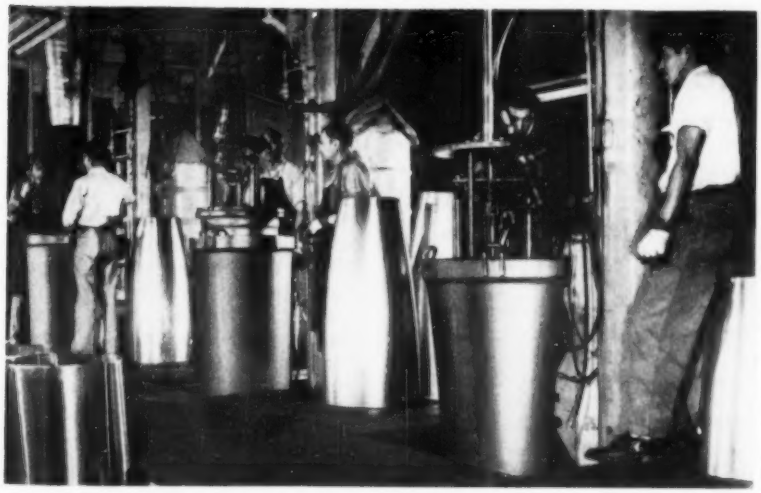
Under the old policy, and presumably under the new one, contracts must exceed $25,000. And the labor-surplus-area firm's bid must be no more than 20% higher than the lowest non-LSA bid.

An area is classified as surplus when 6% of its non-farm-labor force is unemployed. Or when declining employment indicates this percentage will be reached soon.

Now qualifying as labor surplus areas are: Lawrence, Mass.; Lowell, Mass.; Providence, R I; Atlantic City, N J; Ponce, and San Juan, Puerto Rico; Asheville, N C; Durham, N C; Winston-Salem, N C; Altoona, Pa.; Johnstown, Pa.; Scranton, Pa.; Wilkes-Barre and Hazleton, Pa.; Pt Pleasant, W Va; Iron Mountain, Mich; Terre Haute, Ind; and Tacoma, Wash.



OVER 200 CARLOADS OF ELEPHANT MACHINE TOOLS, like the ones shown at right, have been built and shipped in the 18 months since Cincinnati Milling Machine Co's Plant No. 2 heavy shop addition opened in Feb 1952. Celebrating the occasion are employees of the "high bay" addition, where machines weighing up to 100 tons are built



STRETCH-FORMING AIRCRAFT FUEL TANKS IN A SINGLE, FAST OPERATION at Pastushin Aviation Corp, Los Angeles. Heliarc-welded aluminum or steel blanks are formed by this battery of hydraulic machines to compound-contour, wrinkle- and tool-mark-free shapes in less than 2 min. Units consist of an elevating mechanism, and a rubber punch hydraulically-expanded against a steel die contoured to finished-part size with tool plastic

Cost-Minded Pentagon Puts Arsenals, Navy Yards on Business Basis

WASHINGTON — If you detect a change in the way US arsenals and other defense agencies are operating, this could be the reason: the Pentagon has a new scheme that requires them to operate like a business—complete with sales, costs and break-even points.

The idea is to give the business men who run the Pentagon a clearer idea of what operations cost, and a sharper idea of where the money goes—something that in times past has been almost impossible to find out.

The new system, called the "Industrial Fund Program," is being pushed to make arsenals, Navy yards, transport activities and the like function as government-owned corporations.

Here's how it works in a Navy yard: Defense Dept gives the yard enough capital to operate, then tells its CO to bill the fleet for repairs and work he does. At years end, the CO is supposed to have replenished his capital out of income. There's no attempt to make a profit, but the CO is expected to break even or explain why to Washington.

Wherever the idea has been used up to now, it has resulted in big savings—both in money and manpower. In operation at Picatinny Arsenal for over three years, it has pinpointed Army tank repair costs, for example, to where the Pentagon knows exactly how much it costs to repair and replace equipment, to pay civilian employees, and to buy spare parts and materials. From this, the Pentagon can allot so much to Picatinny's CO for running each segment of the arsenal's operations.

Picatinny now "sells" its work to the Army and is paid back directly by that branch. For example, if Picatinny repairs and modernizes a hundred tanks at $10,000 each, it gets a check from Army Ordnance or Field Forces just as if it were doing the work on a civilian contract.

Today, the scheme is being carried out at Picatinny and six other Ordnance arsenals, at two Chemical Corps arsenals; at the Philadelphia, Boston, Charleston and Norfolk Navy Yards; and on the Military Sea Transportation Service.

Defense Secretary Wilson has appointed a businessman team to determine other government areas where the idea can be used, such as laundries, bakeries, food processing plants, surface transport.

Business Items

Gairing Tool Co, Detroit, has acquired outright **Conner Tool & Cutter Co's** line of interchangeable spade drills and core drills. All manufacturing operations have been moved to Gairing's plant.

Chicago Pneumatic Tool Co has acquired the assets of **Jacobs Mfg Co,** West Hartford, Conn, manufacturers of chucks. Manufacturing and sales operations will remain unchanged, except that they will be carried out by a new subsidiary of Chicago Pneumatic Tool, The Jacobs Manufacturing Co (a New Jersey corporation.)

Garden State Machinery Corp has been formed at 59 Edison Place, Newark, N J, by Richard M Barrett, Morton B Sunshine and Philip Lavenda. Garden State will buy and sell new and used machine tools and plant equipment.

American Sinterings has been formed as a division of **American Tool Works of Hartford, Inc.** The division will produce electrical and mechanical components, handling the entire job from basic engineering to finished product. Division's address is 132 Allyn St, Hartford, Conn.

Consolidated Products Co, Inc, New York, has acquired **Condenser Service & Engineering Co, Inc,** and its affiliates: **Edge Moor Iron Works,** Edge Moor, Del; **Scranton Pump Division, Blackburn-Smith Mfg Co;** and **Instrument Service Co.** Consolidation will enlarge services in the fields of engineering, fabrication and erection of boilers, surface condensers, evaporators and heat exchangers.

Mannesmann-Meer Engineering & Construction Co has been formed at Easton, Pa., to plan and install seamless tube mill machinery and hydraulic equipment manufactured by **Mannesmann Works,** Germany, and Maschinenfabrik Meer A G.

Chain Belt Co, Milwaukee, has purchased **Shafer Bearing Corp,** Downers Grove, Ill., in order to broaden markets for its power transmission products. Shafer Bearing now becomes a Chain Belt Division with management unchanged.

American Cam Co has moved to new, 20%-larger quarters at Bloomfield, Conn. Mailing address remains at Hartford 1, Conn.

Has US Industry Bitten Off More Plant Than It Can Chew? No! Says MAPI Report

NEW YORK—Has the $150 billion of business expenditures for new plant and equipment since 1946 created an over-abundance of productive capacity? The answer is NO, according to a recent study prepared by the Machinery and Allied Products Institute.

The MAPI study of changes in the total stock of business capital goods over the period 1910-1953 has turned up two important conclusions:

- The combined stock of plant and equipment in 1953 is not excessive by historical standards.
- Recent growth in the total supply of business capital goods has been one-sided. Equipment stocks have increased substantially. But the value of plant per worker in 1953 is less than it was in 1930.

Early attempts to estimate stocks of capital goods proceeded on the assumption that equipment was retired after 15 years, while plant assets remained in service for 40 years.

Old Method Had Drawbacks

But this method had two drawbacks: (1) Business capital goods were not automatically discarded on the assumed dates—actual retirements were widely dispersed, and (2) capital asset life depends on such uncertain factors as the general business outlook and technological progress.

During periods of emergency mobilization, for example, when supplies are tight, capital equipment may be kept in service beyond the normal retirement date. On the other hand, when competition is keen, businessmen may retire some plant and equipment—although its span of usefulness has not come to an end—and substitute new, more efficient installations in order to stay abreast of rival producers.

The MAPI analysis meets the problem of retirement dispersion by using a series of percentages that indicate the proportion of original installations of plant and equipment still in service after a specified number of years. But it is impossible to measure the effect of economic and technological changes on the stock of capital assets.

These "survival percentages" (Table I) furnish useful and interesting information about the life span of our productive assets.

TABLE I — ORIGINAL PLANT & EQUIPMENT STILL IN SERVICE

YEARS	EQUIPMENT	PLANT
10	80%	99%
20	33	93
30	12	80
40	4	68
50	1	50
60	0	31
70	0	17
80	0	10
90	0	3
100	0	0

When these two series of percentages are applied to the annual figures on business expenditures for plant and equipment it is possible to compute the value of the total stock of capital assets in any year. It is also possible to indicate changes in the stock of these installations over a period of years.

MAPI statistics show that our stock of capital assets has climbed from a level of $190 billion in 1910 to a peak figure of $515 billion in 1953. But this 271% increase in the stock of capital goods is not a guide to the rise in capital investment per worker. Nor is it a fair measure of the gains in production enjoyed by the nation.

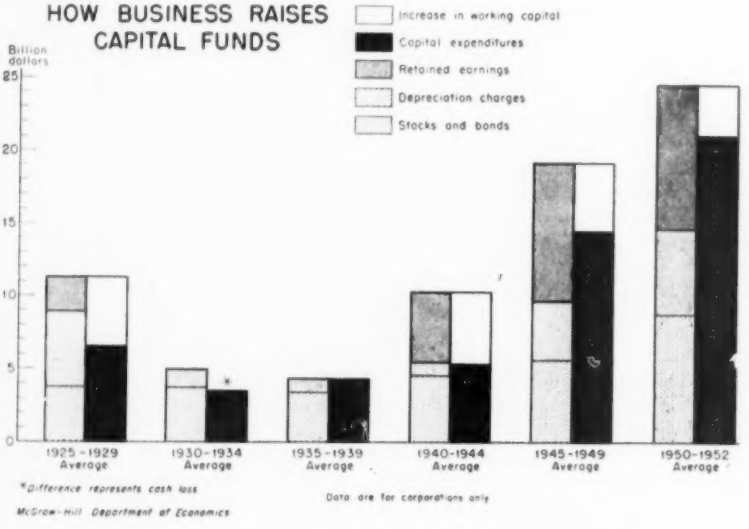
Present stocks of capital goods serve a labor force of approximately 63 million. The labor force in 1910 was 38 million. Table II shows the increase in business capital goods per worker.

Total stocks of capital goods per worker in 1953 are at an all-time high of $9,200. But, this does not indicate that the nation has excessive productive capacity. The growth in per-worker capital assets from 1910 to 1930 ($1900) was at a rate of 1.6% a year. If this rate of expansion has been maintained through 1953, capital assets per worker would now total $10,100. By historical standards —using the 1910-1930 growth rate as a yardstick—the nation has a deficiency of 10% in per-worker supplies of business capital goods.

Plant assets per worker in 1953 are below the 1930 level. Equipment stocks—as a result of recent increases—have advanced by 65% since 1930. The $1600 increase in per-worker supplies of total capital assets from 1930 to 1953 was due en-

TABLE II — CAPITAL ASSETS PER WORKER 1910-1953

YEAR	PLANT	EQUIPMENT	TOTAL
1910	$3900	$1800	$5700
1915	4200	1900	6100
1920	4250	2250	6500
1925	4300	2600	6900
1930	5000	2600	7600
1935	4700	2400	7100
1940	4600	2400	7000
1945	4400	2600	7000
1950	4600	3800	8400
1951	4700	4100	8800
1952	4800	4200	9000
1953 (est)	4900	4300	9200



tirely to this rise in equipment stocks.

Why have plant assets lagged behind the gain in equipment stocks? These are possible reasons for this trend.

- **More efficient use of plants** as a result of improved layout, superior equipment and new materials handling techniques. More goods can be produced per sq ft of space with highly automatic and continuous process operations.
- **Plants last longer today.** Plants put up just before and during World War II were built with postwar conversion purposes in mind. They are heavy, rugged installations and are almost certain to provide long years of service.
- **Some industries require less plant.** Chemicals, petroleum, petro-chemicals and electric power industries are characterized by an unusually high degree of out-of-doors operations.
- **Equipment has outstripped plant** in modernization. While new industrial plants represent an improvement over older installations, the technical advantages enjoyed by new plants do not measure up to the phenomenal improvements in equipment design, manufacture and use.
- **Tendency to shore up existing plant**—some manufacturers repair a worn-out plant although they are constantly on the alert for the newest and the best in equipment. This tendency is certain to impose a severe burden on management at some future date. Aside from its merits—or demerits—as a place to work, an old, patched-up plant has poor noise control, is expensive to heat and to light and often has too low a ceiling and too weak a floor for modern industrial operations.

It is sometimes argued that postwar price trends favored the installation of equipment rather than plant. Table 3 shows the course of plant and equipment costs over the period 1947-1953:

This table indicates that equipment and plant prices have gone up by approximately the same amount since 1947. In certain years, however, the price trends definitely favored equipment purchasers. From 1949 to 1950 equipment prices rose by 3% while plant costs increased by 8%. On other occasions, however, plant costs did not climb as rapidly as equipment prices. From 1950 to 1951, for example, plant costs rose by 8% while equipment costs increased by 14%.

Nothing in the recent buildup of productive assets suggests that demand for capital goods is about to dry up. On the contrary, indications are that the level of capital goods production will remain high.

The recent survey of business' plans for new plants and equipment conducted by the McGraw-Hill Department of Economics reveals that industry expects to maintain capital outlays at high levels through 1956. And as the total stock of capital assets expands the volume of capital goods production required merely for replacement purposes rises. According to MAPI calculations, about $14 billion of capital goods output is needed to replace goods retired within the course of a year.

Overseas demand for American capital goods is also increasing. Manufacturers of textile equipment, tractors and metalworking machinery consistently export about 20% of total production.

TABLE III — PLANT & EQUIPMENT COSTS 1947-53 (1947=100)

	EQUIPMENT	BUILDING COST
1947	100	100
1948	108	110
1949	114	112
1950	117	120
1951	131	128
1952	132	133
1953	134	136

Plant Expansion

A O Smith Corp's Welding Product Div has moved from Milwaukee into expanded quarters at Elkhorn, Wis. And another 16,000 sq ft is being added to the Elkhorn plant.

Morris Bean & Co is building an addition to its Antioch Process Aluminum Foundry, Yellow Springs, Ohio, bringing total manufacturing space to 88,000 sq ft. Full production is expected by January. Also underway are additions to Morris Bean's ductile iron foundry in Centerville, Ohio.

Motorola, Inc, plans to double the size of its Phoenix, Ariz, electronics manufacturing plant and research laboratory. The new unit will contain more than 40,000 sq ft of floor space and will employ some 300-400 additional technicians. Work will be devoted primarily to military contracts.

Tube Distributors, suppliers of alloy stainless and carbon steel tubing, have moved their general offices, stock and heavy equipment from Brooklyn, N Y, to air-conditioned offices recently completed in Garden City, LI, N Y. The new 45,000-sq-ft warehouse, with railroad siding, has more floor area than the company's six Brooklyn facilities combined.

Fletcher Aviation Corp, Pasadena, Calif, has begun construction of a 94,600 sq ft aircraft parts factory

END-WELDING ⅝-IN. STEEL STUDS TO WIND TUNNEL COMPRESSOR RING is credited by Westinghouse Electric Corp with saving close to $100,000 in fabrication of five giant compressor stators for Arnold Engineering Development Center's wind tunnel. Using a simple templet to insure stud location within .015 in., operator end-welds granular flux-filled studs. Equipment consists of power unit, control unit and cable-connected 5-lb trigger-actuated hand gun

Distributors Named

Lee Horneyer Co, 7 N Grand Blvd, St Louis — for **Genesee Mfg Co's** line of adjustable hollow mills, facing, counterboring and special production tools.

Clare Perlin & Associates, 107 Columbia Ave, Park Ridge, Ill. — for **Simmons Machine & Tool Corp's** boring and facing mills and lathes up to 72-in. swing, and machine tool reconditioning service in Wisconsin, Illinois and Indiana.

Satterlee Co, 118 Washington Ave N, Minneapolis — for **Reid** Precision Surface Grinders.

Muratet & Co, Tulsa, Okla — for **Size Control Co's** eight lines of precision tools and inspection gages in northern Oklahoma.

Tool Supply & Engineering Co, Dallas (for northern Texas); **Willard H Johnson,** Rock Island, Ill, (for northern Illinois except Chicago); **A M Schmit Co,** Toledo (for northwestern Ohio); **Charles W Bringman,** Orlando, Fla (for Florida); and **Morris Steel & Supply Co,** Albuquerque (for New Mexico) — for **Velsey** granite surface plants and **Elkro** industrial stands.

E A Kinsey Co, Dayton, Ohio; **James H Cross Co,** Erie, Pa; and **Harris Pump & Supply Co,** Pittsburgh— for **Scully-Jones** holding tools.

McVoy-Hausman Co, Birmingham (for Alabama); **Briggs-Weaver Machinery Co,** Dallas (for Texas); **James Engineering & Machinery Co,** Detroit (for Detroit area) — for **V & O Press Co's** power presses and automatic feeds.

Barwood & Co, 3137 N 15th St, Philadelphia — for **B C Ames Co** micrometer dial indicators and gages in the Philadelphia, Baltimore, Trenton, N J areas.

Metalec Sales, Inc, 1135 Fisher Bldg, Detroit — for **Scovil Mfg Co's** small stampings, assemblies, wire formed parts, forgings, etc, in Detroit.

Pacific Airmotive Corp, Burbank, Calif — exclusive US distributor for aircraft equipment designed and manufactured by **Sir George Godfrey & Partners, Ltd** of England, including turbo refrigeration equipment, superchargers, fans, aircraft silencers, etc.

Metalworking Gets New Boost As UHF-TV Opens Giant Market

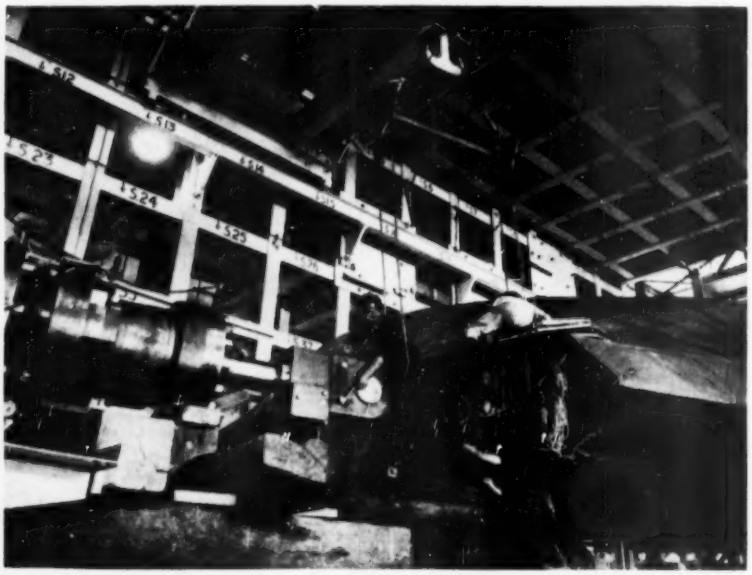
EASTON, PA — Metalworking will benefit from the vast new components market created by ultra high frequency television for "area" transmission. As the first 5000 watt station, WGLV, went on the air here this month, UHF was proved practical as a method of transmitting quality television to the many now-unreached areas. Because UHF utilizes more metal *parts* than wire, far more than the VHF (Very High Frequency) now conventional, the newly created demand for receivers and converters will provide a huge market for these parts.

Heart of the 5000 watt system at Easton is the Klystron tube and its arteries are metal "wave guides". It is one of the most powerful UHF transmitters ever built and is the result of years of intensive research by the Allen B DuMont Laboratories.

This station contains the newest design of Klystron tube, made by the Eitel-McCullough Co. The transmitter is designed to provide effective television coverage throughout an average radius of over 40 miles at a cost equivalent to VHF. This represents nearly 1 million population.

Receiver sales experience shows that, in an area where TV was not previously available, 50% of the family population will buy sets the first year. Where reception has been available on a fringe basis, 25% of the family population not owning sets will buy and the people who own VHF sets will convert or trade for dual reception equipment.

To Metalworking UHF means business. At this extremely short wavelength the electrons cannot be efficiently carried by wire hence it is necessary to use "plumbing" in the form of wave guides. These duct-like conductors are precision instruments; are stamped from sheetmetal, precision cast, or made by electroforming. Tuning and control are critical and require accurate leadscrews together with precise gearing. Guides are used in transmitters and in receivers. The Klystron tube, too, is largely precision metal parts. In addition to the electronic parts, there will also be increased demand for special manufacturing and testing equipment. It took the automobile industry 30 years to gain the acceptance television has achieved in only five years. UHF-TV provides another major step in this progress.



WORLD'S LARGEST STRESS TESTING FRAME FOR SHIP'S HULLS in operation at the Royal Naval Dockyard, Rosyth, Scotland. View taken from inside frame shows hydraulic jack (left), designed to exert pressures equivalent to those encountered in actual service upon full-scale hull sections

A H Davis

John E Brennan

J R Miller

Theodore H Booth

Names in the News

A H Davis has been appointed works manager of R K LeBlond Machine Tool Co, Cincinnati. Mr Davis, who has been associated with the firm for eighteen years, was formerly assistant works manager. **D W LeBlond** has been named to succeed him; **L M Boutton** is new assistant shop superintendent, and **D W Helvey,** night superintendent.

S M Jenks has been appointed to the newly-created post of assistant executive vice president, operations, of US Steel Corp. **John H Elliott** has been named vice president, operations, steel, succeeding Mr Jenks, and **E H Gott** takes over Mr Elliott's post as general manager.

J J Basch, former Philadelphia division manager for Oakite Products, has been appointed manager of research and product development. A member of the board of directors since 1948, Mr Basch has also been elected a member of the executive committee. **E H Steif,** general attorney for the company, has been named assistant secretary, and elected to the board; **W A Baltzell,** former southern division manager, is new assistant sales manager.

A B Capron has been named assistant works manager in charge of tube mills and engineering, and **Newell Hamilton** has been appointed manager of steel operations in the Tubular Products Div, Babcock & Wilcox Co, Beaver Falls, Pa. Mr Capron joined the company in 1937; he has served as superintendent of tube mills, and has been chief engineer since 1952. Mr Hamilton moves up from his post as superintendent of the steel mill.

John E Brennan has been appointed to the executive staff of Chrysler Corp's Dodge Div. His new post will be in addition to his present duties as general manager of the Chrysler jet engine plant at Utica. Mr Brennan will undertake several executive assignments in Dodge Div, and his administrative responsibility for defense activities at the San Leandro, Calif, plant will be extended to include civilian activities.

J R Miller has been appointed to the newly-created post of staff assistant to the executive vice president of the Dana Corp, Toledo. Mr Miller, who will deal with matters relating to manufacturing, has been vice president and a member of the board of directors of the Beaver Tool & Engineering Corp, Royal Oak, Michigan since 1945.

P L Coddington has been appointed assistant to the president of the Carpenter Steel Co at the firm's Alloy Tube Div, Union, NJ. Sales manager of the division since 1945, Mr Coddington formerly served with the Iron and Steel Div of the War Production Board in Washington. **William R Staples,** former assistant manager of sales, succeeds him.

Clark Langworthy has been appointed chief engineer for industrial hydraulic products of Parker Appliance Co, Cleveland. The new division which Mr Langworthy will head is now manufacturing the recently acquired Sundstrand line of hydraulic valves and pumps. For the past eleven years Mr Langworthy has been associated with Vicker's Inc, in various engineering capacities.

Theodore H Booth, recently appointed general manager of Carborundum Co's Bonded Products and Grain Div, has been elected vice president. Prior to joining the company in 1952 as director of manufacturing, Mr Booth was assistant vice president in charge of manufacturing of Walworth Co, New York.

Eugene B Files has been appointed manager of sales for Republic Steel Corp's Union Drawn Div, succeeding the late Fred C Young. A member of the organization for the past 33 years, Mr Files has been connected with the Detroit office as assistant district sales manager. His new headquarters will be in the division's Massillon, Ohio, office.

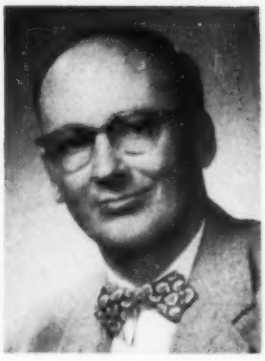
George C Steyskal has been appointed factory manager of Standard Tool & Manufacturing Co, Detroit. He will have the additional responsibility of heading the recently-established service department. **David A Tyo, Jr,** newly-appointed plant superintendent, will assist Mr Steyskal.

Douglas M Jones, formerly assistant chief engineer and technical consultant, has been appointed chief engineer of Axelson Manufacturing Co Division of Pressed Steel Car Co. He succeeds **Glynn H Williams,** advanced to a special production engineering post.

Calvin W Tittsler has been named eastern and southern regional sales manager for Deluxe Saw & Tool Co, High Point, NC, a subsidiary of Rockwell Manufacturing Co. Mr Tittsler has been service engineer at the company's Crescent Machine Div at Leetonia, Ohio, for the past 13 years.

E H H Graf

John Reich



Dean M Cochran

E J Vargo

E H H Graf has been elected vice president in charge of sales, Detroit Broach Co, Rochester, Mich. Mr Graf, who joined the company as sales manager early this year, has been associated with the broaching industry for many years, 14 of which were as Detroit representative of the Oilgear Co, Milwaukee, Wis.

Jack E Lawson has been named to head sales in the Detroit area for Circo Equipment Co, Rahway, NJ, manufacturers of vapor degreasers and metal cleaning products.

Jack L Modrich is new general sales manager for Mechanical Air Controls, Inc, Detroit. He has joined the organization after a ten-year association with Miller Motor Co as sales manager. **Edward L Rodgers** has been appointed chief engineer, and **Larry Newton,** purchasing agent.

C B Spase has been appointed chief engineer of automotive development and research, Lipe-Rollway Corp, Syracuse, NY. Formerly chief engineer of the Clutch Div, Mr Spase is succeeded by **Robert S Root,** assistant, who assumes responsibility for present and future heavy-duty clutch development, as well as customer engineering relations.

John Reich has been advanced to the post of factory manager of Hyster Co's Danville, Ill, plant. Mr Reich joined the company in 1946; prior to his new appointment he was assistant factory manager at the Peoria, Ill, works.

Dean M Cochran has been appointed assistant sales manager, Hydraulic Press Manufacturing Co, Mount Gilead, Ohio. In addition to administrative sales activities, Mr Cochran will also manage the company's Metalworking and Process Press Sales Div.

Newton H Willis has been named manager of Waukesha Motor Co's Railway Div; he succeeds **L W Melcher,** retired. Mr Willis joined the company in 1930 and began work with the division three years later, where he progressed to the post of chief engineer.

R Carter Dye has been appointed manager of the Automotive Dept, Reynolds Metals Co. Before joining the organization in January of this year, Mr Dye was a sales executive with R A Rowan & Co, Los Angeles. He will make his headquarters in the company's Detroit office.

E J Vargo has been named assistant production manager, Wellman Bronze & Aluminum Co, Cleveland. He is rejoining the company after serving for the past year as works manager of Ebaloy Foundries, Rockford, Ill. Prior to that, Mr Vargo was associated with Wellman for eleven years as metallurgist and plant superintendent.

Robert E Kimmins has been named assistant to the steel sales manager, Firth Sterling, Pittsburgh. He will take over the responsibilities of the company's high temperature alloy steels. **Raymond J Zale,** steel metallurgist, has been appointed assistant in charge of sale and promotion of tool steel products.

A J Jones has been named chief engineer of Landis Tool Co, Waynesboro, Pa. A member of the firm for the past 17 years, Mr Jones has most recently been in charge of sales engineering.

Charles E Schmitt has been named Ohio sales engineer for the Ace-Central States Machine Tool Co, Detroit. Mr Schmitt was formerly machine and tool buyer for the Cleveland Cadillac tank plant.

C B Spase

R Carter Dye

A J Jones

Charles E Schmitt

Laurin D Woodworth has been named general superintendent and **Oscar Pearson** assistant general superintendent of United States Steel Corp's Youngstown District Works. Mr Woodworth was formerly assistant general superintendent; Mr Pearson was assistant general superintendent of US Steel's Duquesne, Pa, Works.

Patrick H Norton has joined Frederic B Stevens, Inc's sales engineering staff and will cover the Western Michigan area.

E A Humble, M C Seeman and **O M Sievert** have been named assistant managers for the Elliott Co in the Boston, Cleveland and Kansas City offices, respectively.

Samuel N Comly, vice president and treasurer of Russell, Burdsall & Ward Bolt and Nut Co, Port Chester, N Y, has been granted leave to serve as assistant administrator of the National Production Authority, Washington. Mr Comly will be responsible for operations of the industry divisions of NPA and will assist in planning and staffing the Business Services Administration.

Maj Gen Alden R Crawford, USAF, Ret, has been appointed general manager of Republic Aviation International, S A, Lugano, Switzerland, where he will coordinate manufacture of spare parts for F-84 jet fighter-bombers for use by NATO member nations.

Richard F Dean has been named supervisor of Rockwell Mfg Co's employee relations and training program. He was formerly assistant to the training director for Koppers Co, Inc.

Arthur M Rothman has been named Metropolitan New York and Connecticut sales engineer for American Silver Co, Inc.

L J Fitzpatrick has been appointed assistant to the general manager of Westinghouse Electric Corp's Lamp Division, Bloomfield, N J.

Robert E Dillon, president, Lake Erie Engineering Corp, has been named a director of Buffalo-Eclipse Corp, North Tonawanda, N Y, and its four manufacturing divisions.

Fred Kaiser has been appointed manager of the Eastern region of Minneapolis - Honeywell Regulator Co and will headquarter in New York. He will be in charge of sales in the company's New York, New Jersey, Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont and Maine territories. He succeeds **Arnold Michelson,** who becomes resident vice president.

Richard J Rand has been named assistant manager of Crucible Steel Co of America's Cincinnati branch sales office. He was formerly assistant branch manager for Crucible in Pittsburgh.

T J Ault, formerly vice president and purchasing agent of Borg-Warner Corp's Warner Gear Division, has been appointed vice president and assistant general manager of Borg-Warner's Detroit Gear Division.

Anthony A Demetriou, for the last two years chief of the financial services branch of the Los Angeles Ordnance District, has joined Northrop Aircraft, Inc, Anaheim, Calif, as assistant contract administrator.

Robert M Barnum has been appointed southern Michigan sales engineer for Union Twist Drill Co's Butterfield Division and will headquarter in Detroit. He was formerly with Bond Supply Co.

Matthew M Lawler has been elected vice president in charge of Worthington Corp's Air Conditioning and Refrigeration Division. A Worthington employee since 1936, Mr Lawler was formerly assistant vice president and manager of the Division. He is a past vice president of the Air Conditioning and Refrigeration Mfrs Assn.

Roman C Bender has rejoined Frederic B Stevens, Inc's metal finishing equipment and supplies sales staff and will cover the state of Indiana.

J H Matthews has been named executive vice president of Raybestos-Manhattan, Inc. He has been a vice president of the company since 1947.

Jerold L Welch has been appointed chief engineer for Reed-Prentice Corp, Worcester, Mass., manufacturers of plastic injection and die-casting machines.

R Wade Willey has been named works manager for Revco, Inc, Deerfield, Mich, food freezer manufacturers. Mr Willey formerly held a similar position as works manager with the Clyde Porcelain Steel Division of Whirlpool Corporation, Clyde, Ohio.

Fred G Littlejohn has been named manufacturer's representative for Horton Chuck Division of the E Horton & Son Co in southern California. He will make his headquarters in Los Angeles.

F W Borchers has been appointed general sales manager for the Bristol Co, Waterbury, Conn, manufacturers of automatic controlling and recording instruments. With Bristol's sales organization since 1922, he has been assistant sales manager since 1948.

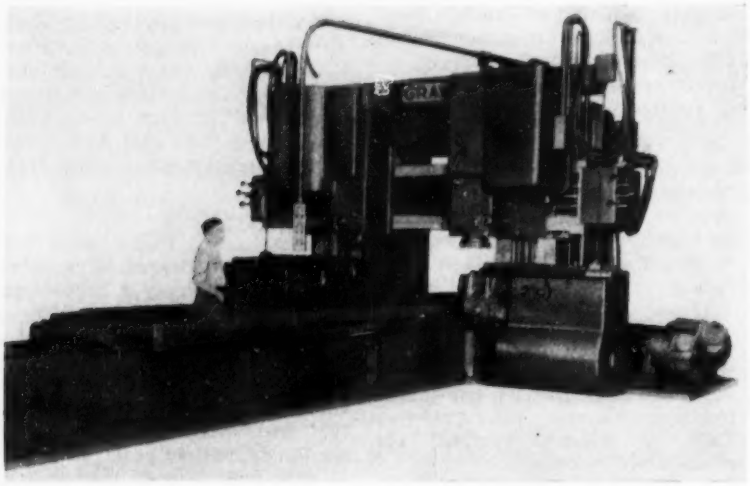
OBITUARIES

Alexander G Bryant, 59, president of Bryant Machinery & Engineering Co, Chicago, and vice president of Cleereman Machine Tool Co, died of a heart attack at his home in Oak Park, Ill, August 25. Mr Bryant, who formed his own company in 1931, had been active in the industry for the past 40 years. He served as president of both the National Machine Tool Builders Association, and American Machine Tool Distributors.

Donald H Montgomery, 57, vice president and director of The New Britain Machine Co, New Britain, Conn, died August 13 at his home in Farmington, Conn, following a brief illness. A graduate of MIT, Mr Montgomery started his career with Acme Machine Co in 1919. In 1927, he founded the Gridley Machine Co in Hartford, Conn. This firm later merged with the New Britain Machine Co to form the New Britain Gridley Machine Co, of which Mr Montgomery was an officer. In 1936, the firm was absorbed into the New Britain Machine Co and Mr Montgomery was named vice president, director and chief engineer, positions he held until the time of his death.

Elwood C Howell, advertising and sales promotion manager for General Electric Co's Carboloy Dept for 24 years, died of a heart attack August 13. After a career with advertising agencies, Mr Howell joined Carboloy Co, Inc, as advertising manager, retaining that position when General Electric took over the company. Mr Howell was past secretary, vice president and director of the National Industrial Advertisers Association; president, Industrial Marketers of Detroit; and chairman of the sales promotion committee, American Supply and Machinery Manufacturers' Assn.

New Shop Equipment



Gray Introduces Line of Heavy-Duty Planer-Type Milling Machines

The 54x48-in., 20-ft double-housing milling machine pictured is one of the new-design planer-type machines introduced by the G A Gray Co. These machines incorporate such standard Gray features as: anti-backlash table drive, non-metallic table ways, unit head construction, quill diameters of 8⅛, 10, 12 or 14 in., Gray planetary transmission, Insto-Shift spindle speed change, and simplicity of control.

The bed of the machine is reinforced with oversize ribs and the double-length design eliminates table overhang. Oil and coolant reservoirs are self-contained within the bed casting. The table is a box section structure and the top has a number of T-slots as well as reamed and countersunk stop-pin holes. Table is regularly provided with a scale used with an adjustable pointer mounted on the bed. Vernier scale or measuring rods can be furnished as extra. Side-thrust bearings run the full length of the bed and table. Lips cast integral with bed engage hold-down gibs on table; gibs can be released without running table off spiral gear.

Buttress-type housings are heavy structures featuring an unusually large face (27 in.; 37 in. on larger machines), oversize square locks (4-in.-thick square lips), extra-heavy parallel side walls, uniform cross section from top to bottom, and closely spaced internal ribs.

All gibs, plates, and bearings are faced with laminated plastic plates. There are no metal-to-metal bearings. This makes it possible to reduce running clearances and is said to permit more accurate head alignment and minimize chatter, thus making higher feed rates possible. Non-metallic table ways can be furnished as an extra.

The Insto-Shift spindle-speed-change mechanism provides speeds from 10 to 500 rpm in 18 steps. Additional speeds up to 1000 rpm, with a total of 21 steps in approximate geometric progression, are available at extra cost. All speeds are usable —there is no duplication or overlap.

Standard milling feeds for the table, rail heads, and side heads are from 1 to 64 ipm. Feed range from 0.2 ipm is available as an extra. Standard range of power feed of quills is from 0.25 to 16 ipm. Standard range of power feed of the rail is from 0.375 to 24 ipm.

Other extras available include power head swivelling at pushbutton control and simplified wiring eliminating subterranean conduits.

The G A Gray Co, Cincinnati 7, Ohio

Vertical Machine Expands and Sizes Metal Tubing

Vertical tube-expanding machine is first in new line of Hill hydraulically powered machines for expanding and sizing metal tubing. Machine is manually controlled and said to be particularly adapted to expansion of copper tubing in evaporator and condenser coil assemblies.

Model illustrated has expansion mandrels mounted on 1-in. centers. Mandrels expand 60 copper tubes (⅜ in. dia) 0.020 in. Another set of 60 mandrels, through which expanding mandrels feed, are picked up near end of downfeed to size ends of tubing for soldered return bend fittings by expanding them an additional 0.026 in. Cycle time, including loading, expanding, sizing, and unloading, is 40 sec.

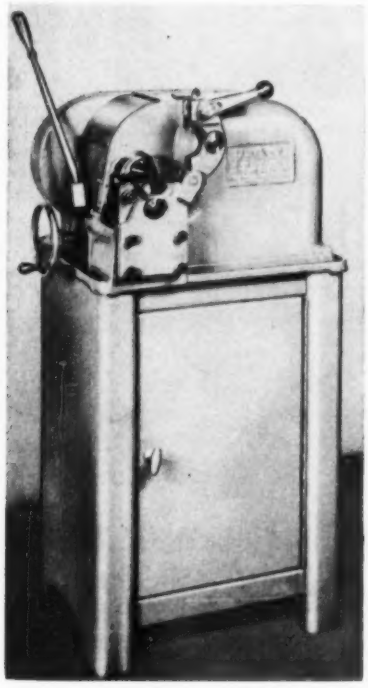
Two hydraulic cylinders in base of machine control mandrel feed-and-return functions through two drawrods. Expanding mandrels have hardened-steel bullet noses and are supported by retaining plates that are guided on drawrods and stack up as mandrels are fed to depth. Shorter sizing mandrels are supported by mounting plate that is also guided on drawrods.

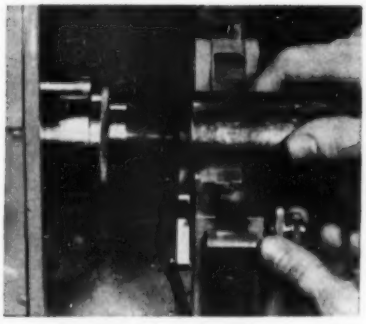
Separate hydraulic pump and tank unit driven by 15-hp motor provides 20 gpm of oil for actuating hydraulic cylinders.

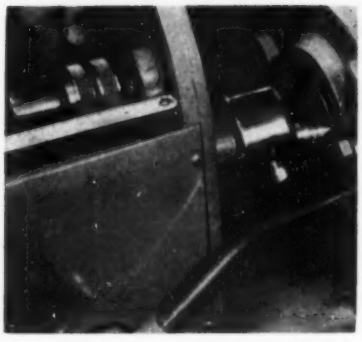
Model illustrated has 40x36-in. base and 30-in. open height.

Walter P Hill, Inc, 22183 Telegraph Rd, Detroit 19, Mich

Materials and Parts







Tube Flaring at High-Production Rate on Parker Machine

Parker power tube flarer was designed to put tube flaring on a high-volume production level. Machine produces 37° tube flares to meet AN, JIC, SAE Hydraulic, and ASME standards. Capacity includes all standard wall thicknesses of tubes with OD from ⅛ to 2 in. made of annealed seamless copper, aluminum, steel, or stainless steel.

With interchangeable heads and accessory attachments, unit can be used for squaring and burring of tubes through same range.

Flaring center, containing an eccentrically located flaring cone, fits into the spindle head. Tube-size graduation on flaring center is matched to index mark on spindle head. When set, flaring center is screw-locked in spindle head. Forward travel of spindle for flaring is regulated by adjusting screw dial nuts on threaded rod.

Tubing is clamped in position by lever-operated, hinged, circular vise. Clamp block sets, properly sized for tube, slide into channels of vise jaws and are secured by circular lock keys. Adjoining the inside of the lower vise jaw is a stop finger to limit the extent of tube beyond the vise. Finger retracts automatically as vise is closed and is spring-returned to its original position as vise is opened.

Power source is a 110-v ac, 1/3-hp motor. Variable-speed pulley arrangement connects spindle to motor.

Setup for production requires: insertion, indexing and locking center; insertion of clamp blocks; positioning stop finger; speed adjustment; and spindle travel setting with dial nuts.

Parker reports that after a little experience, an operator can set up machine in less than 5 min. Then, for each flaring, operator places tubing against stop finger, closes vise, and thrusts spindle lever forward.

Parker Appliance Co, 17325 Euclid Ave, Cleveland 12, Ohio

... INCLUDING

Hydraulic flanging press has two 300-ton cylinders acting independently or simultaneously page 202

Centralized lubrication system services 5 to 12 bearings on standard inclinable or straight-side punch presses page 203

Universal machine tool with attachments perform at least 50 operations page 204

Pipe-threading machine with standard range of 1 to 4 in. incorporates four spindle speers page 206

Seven-station machine drills and reams 50 Diesel locomotive cylinder heads per hour page 208

Equipment for consumable-electrode gas-shielded welding is reported to double output on certain applications page 216

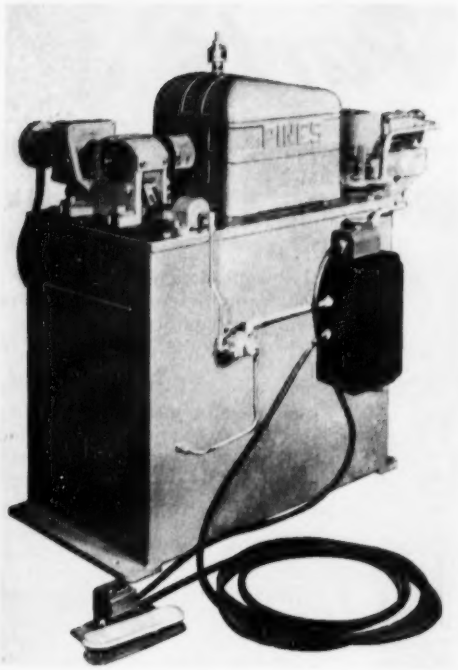
Precision hand power tool, equipped with 40 accessories, attains speed of 25,000 rpm page 218

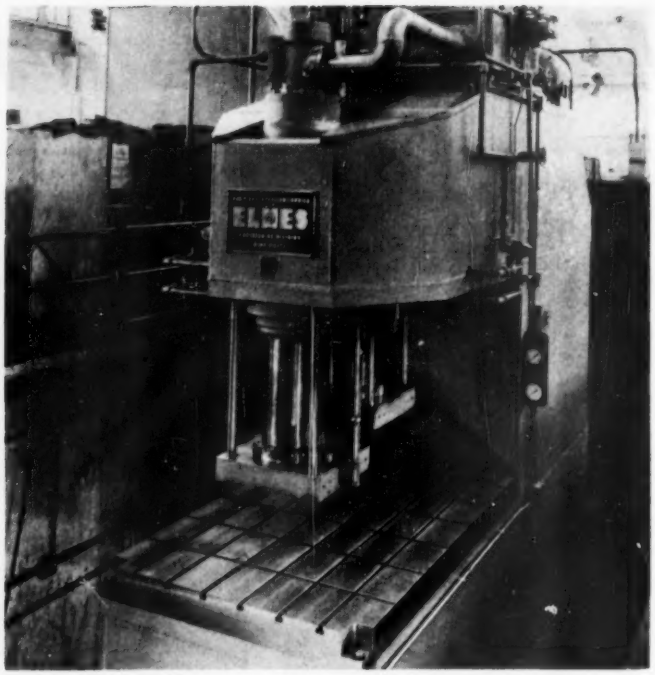
Corrosion-resistant globe and Y valves for pressures to 50 psi and temperatures to 150 F are constructed of polyethylene page 220

... and in Sept 28

Automatic six-spindle turret drill features manually controlled, infinitely variable hydraulic feed.

Gear tester checks all types of fine-pitch gears and provides visual indication with 0.0001-in. sensitivity.





End-Finishing Machine Speeds Deburring, Facing Operations

Pines series 700 air-operated end-finishing machine, with 3-in.-OD work capacity, has 2-in. stroke and max spindle speed of 2000 rpm. Tools and chuck jaw inserts are interchangeable to fit required work diameters.

Chuck and spindle air cylinders are controlled through electric foot switch. Switch closes chuck, work-locating stop is pivoted clear by air cylinder mounted on side of clamping unit, and spindle is advanced by Bellows air cylinder with a hydrocheck which controls tool feed rate. Chuck and spindle-advance cylinders operate from same line at 70-80 pounds pressure. Cycle time of unit, less cutting time, is 1.5 sec.

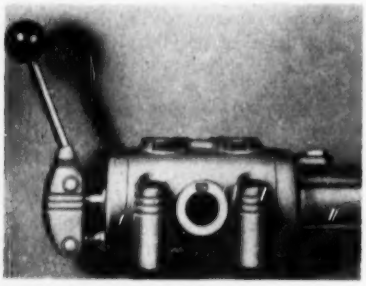
Machine base is 20x39 in. with 6 in. chuck overhang and 18 in. overhang of spindle unit to rear. Weight of unit, complete with air-operated cylinder, is 850 lb.

Pines Engineering Co, Inc, 601 Walnut St, Aurora, Ill

600-Ton Hydraulic Press Combines Two in One

Elmes hydraulic flanging press is designed so each 300-ton cylinder assembly can be operated independently or so both can be operated together to provide 600-ton capacity. Power for each cylinder is supplied by individual hydraulic pump. Control is provided through single pendant station operating on a swivel.

American Steel Foundries, Elmes Engineering Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio



Hydraulic Valve Piston Held By Ball Detents

Rivett Lathe & Grinder, Inc, offers hydraulic four-way valve with ball detents to hold valve piston in position. Locking action of detent permits valve to be mounted vertically as well as horizontally and prevents vibration from causing movement of valve piston.

Valve is available with one, two, or three detents. One-detent valve holds piston in center position; two-detent holds two end position; three-detent combines the two. Available types of operation include threaded stem, lever, and knob; five piston types meet the requirements of any hydraulic circuit. Sizes include: ¼, ⅜, ½, ¾, 1, 1¼, and 1½ in. Pressure capacity is 1500 psi.

Another feature of Rivett four-way valves is the floating piston design. The piston is a close fit in the bore because the fit is independent of the fit of the valve stem in the covers. The valve stem is supported in bearings in the valve covers.

Rivett Lathe & Grinder, Inc, Brighton 35, Boston, Mass

Production Spring Tester

Spring tester, capacity 100 lb, is adaptable for general purpose and high quantity production testing; it has been used at rate of 400 to 600 tests per hr. Springs with diameters up to 4 in. and lengths to 12 in. can be tested. Steel rules measuring lengths in 32nds and 64ths on one side also measure lengths in decimals on reverse side. The 15-in.-dia dial meets NBSR accuracy requirements of ¼ of 1%.

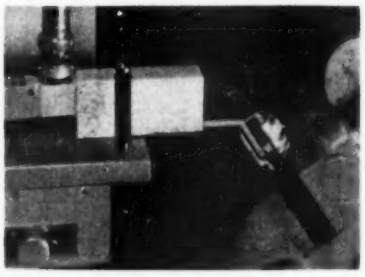
The Carlson Co, 277 Broadway, New York 7, NY

Aluminum Welding Flux

Type 202 aluminum welding flux, developed by Solar Aircraft, permits operator to see what he is doing while welding; flux is sufficiently active and fluid to carry off the opaque slag blanket from the weld puddle automatically.

Product starts to reduce oxides immediately upon application, and continues throughout heating cycle. It is easily removed after operation and will not produce corrosive pitting. It becomes liquid at the point in the heating cycle when metal is ready to weld, serving as a temperature indicator. Oxyacetylene flame can be used without fear of overheating. Available in 1-lb containers.

Solar Aircraft Co, 2200 Pacific Highway, San Diego 12, Calif



Device Measures Surface Roughness on Internal Tapers

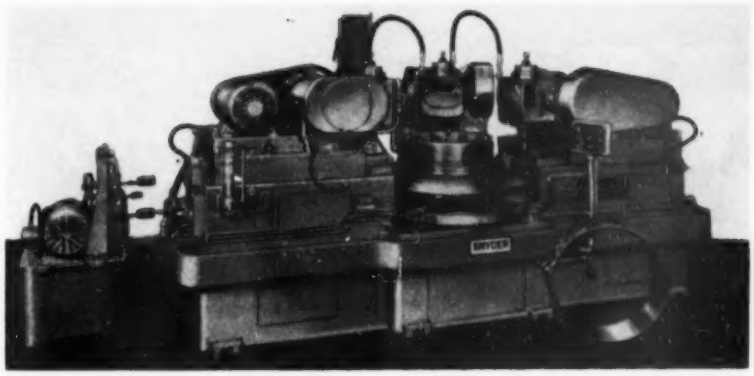
Micrometrical Profilometer type KC tracer measures surface roughness on internal tapers, across internal shoulders, and on other surfaces that can only be reached by a tracer with dogleg beam. Tracer can also be used on any other internal or external surface where geometry of work permits and where part can be mounted on a linear pilotor with work surface horizontal.

Micrometrical Manufacturing Co, 345 S Main St, Ann Arbor, Mich

Magnetic Holders Exert 50-lb Pull

Magna-Holders are available for holding indicators or flood lamps. Price of either model is $8.50. Permanent Alnico magnets exert 50-lb pull and permit mounting on any ferrous surface.

Cullen Manufacturing Co, Racine, Wis



Automatic Machine Processes Jet Engine Compressor Casings

Machine consists of fixture mounted on rotary table driven by hydraulic motor. Spaced around table are three way-type milling units, each controlled by Turchan follower hydraulic system.

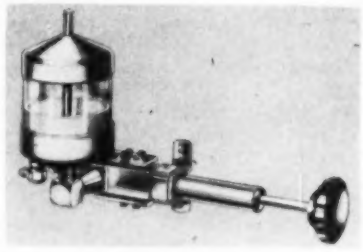
Operation of machine is to profile four rows of lugs projecting from outside of thin-walled cylinder made of stainless steel. Lugs must be milled to a depth of 1⅜ in. at extreme and work is done in two rough and one finish cut. One milling unit does the profiling of all four rows of lugs while the other two units cut off some of the lugs at different intervals.

Tracer valve for Turchan system projects from front of unit between the ways. In advance position it contacts templet which is mounted on rotary table beneath fixture.

Toughness of work material requires sturdy machine construction. Rotary table has speed reduction of 240 to 1 between motor and table accomplished by two cone worm-speed reductions in series, the last of which has split worm gear to remove backlash.

Table rotation produces feed rate of machine. Feed rate is varied automatically during profile operation, being controlled by tracer valve on profile unit. Whenever profile unit has to make a rapid radial motion, speed of table is reduced to insure that cutter will accurately profile part. Average table speed is about 3 ipm.

Snyder Tool & Engineering Co, 3400 E Lafayette, Detroit 7, Mich



Centralized Machine Lubrication System

Centralized lubrication system, Lincoln Multi-Luber, is designed to service from 5 to 12 bearings on standard inclinable or straight-side punch presses and similar types of production machines. System is designated by maker as install-it-yourself-type and sells for $29.95.

Manually-operated system simultaneously applies controlled amounts of oil or light grease to bearings while machine is in operation. Optional flexible feed line and swivels are available for connection with motion-type bearings.

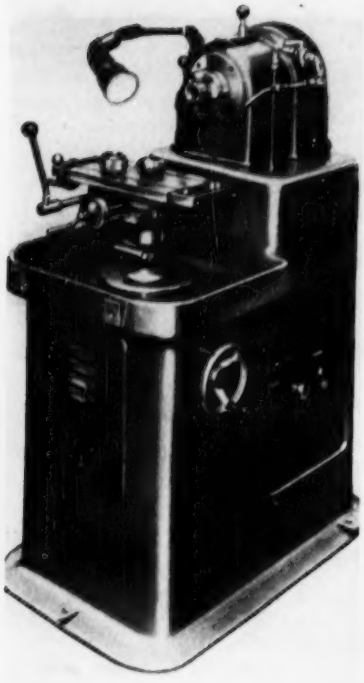
Advantages claimed include: higher efficiency, less bearing wear, reduced downtime for maintenance, and elimination of hazards encountered in hand lubrication.

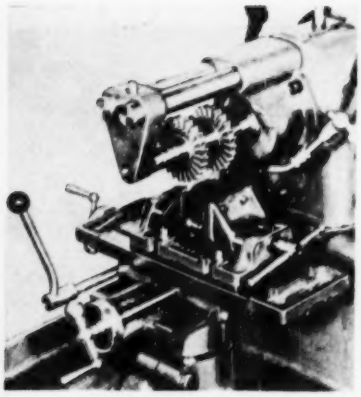
Lincoln Engineering Co, 5701 Natural Bridge Ave, St Louis 20, Mo

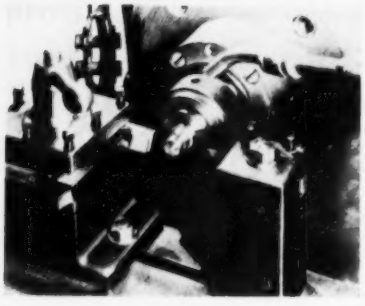
Weight Recorder

Mechanoprint is a mechanical weight recorder built in as an integral part of the Howe Tape-Drive dial head; touch of the push-bar prints weight in one second's time. Located on the right-hand side of the dial head, unit is furnished for standard straight ticket, ticket and tape, odd-size tickets, and with identifiers, manual or electric time and date stamp, and consecutive numbering devices. Accuracy is guaranteed to 1/10th of 1% of dial chart capacity.

Howe Scale Co, Rutland, Vt







British Universal Machine Tool Performs 50 Operations

1. Bandsawing
2. Boring
3. Centerless grinding
4. Centering
5. Chamfering
6. Circular die grinding
7. Cross drilling
8. Cup wheel grinding
9. Cutting-off with circular saw
10. Cutting-off with high speed abrasive wheel
11. Cylindrical grinding (between centers)
12. De-burring
13. Die grinding
14. Disc sanding
15. End milling
16. External grinding
17. Face milling
18. Filing with 12" circular disc
19. For grinding (with air grinder)
20. Gang milling
21. Gap gauge grinding
22. Heavy duty disc grinding
23. Hob grinding
24. Horizontal milling
25. Internal grinding
26. Keyway cutting
27. Lapping
28. Polishing
29. Reciprocating slotting
30. Routing
31. Rotary filing
32. Sawing
33. Second-operation work
34. Slitting
35. Spline grinding
36. Spline milling
37. Spur gearcutting
38. Surface grinding
39. Taper grinding
40. Taper turning
41. Tap re-grinding
42. Thread milling
43. Tool and cutter grinding
44. Trimming
45. Twist drill grinding
46. Tungsten carbide grinding
47. Turning
48. Valve grinding
49. Vertical milling
50. Woodruff keyway milling

Rindis Model EF 52/12 universal machine with attachments performs at least 50 operations. The basic machine (left) consists of cast-iron pedestal on which spindle head is mounted, and a compound slide on a movable column. Front compartments of pedestal contain coolant tank and centrifugal pump with the rise-and-fall mechanism for the compound table; rear section contains bracket carrying main electric motor.

By a V-belt system, drive from motor gives a range of 19 spindle speeds from 64 to 2150 rpm. Using an additional pulley, two extra speeds of 2250 and 2700 rpm can be obtained.

Nickel-chrome steel hollow spindle runs in tapered roller bearings; locating pad at front takes up to 1-in. collets. Nose is threaded 1⅞ in. Acme for chucks and other accessories. Two locating pads are machined at front of head for accurate location of various attachments. Spring-loaded plunger prevents spindle rotation while changing accessories. By removing cover plate, roller bearings can be taken up to maintain constant spindle accuracy.

Rise-and-fall compound table has hand-operated travel, longitudinal and transverse, through leadscrews. Longitudinal travel is 8 in.; transverse travel and vertical movement, 6 in. Table (12½x6½ in.) swivels 360°. Micrometer dials have 0.001-in. graduations.

Imported by Newage International Inc, 235 E 42nd St, New York 17, NY

Soldering Flux Test Kit

Divco soldering flux test kit, available in larger size, includes 24 items of increased test quantities of fluxes, thinners, residue removers, and chemical wire strippers. Chart 52 gives description, applications, use ratings for 20 metals and alloys. Price, $5.00.

Division Lead Co, 7742 W 61st Pl, Summit, Ill

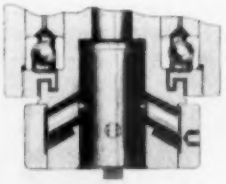
Quick-Change Spindle For Fosdick Machines

Quick-change, high-precision spindle for Fosdick jig borers and automatic positioning machines. B F spindle incorporates high-precision version of Beaver toolholder built integrally with spindle. Claim is that tools can be changed in less than ten seconds with such accuracy that hole sizes may be repeated within ±0.0001 in. without resetting boring tools.

Straight-shank adapters are used to hold tools not provided with Beaver shanks. Tool is locked in spindle by two cam-ring-actuated plungers which draw flanged adapter shank firmly against ground nose of spindle. Spanner wrench rotates cam ring fraction of rev to lock or unlock tool.

Available as extra equipment on Fosdick machines mentioned, spindle can also be adapted to machines in the field. Adapters are available to accommodate Nos 1, 2, 3, and 4 Morse taper, 5, 7, 9 and 10 B&S tapers, No. 40 N M T B taper and straight bores from ¼ to ½ in. and ½ to 1¼ in. in eighths.

The Fosdick Machine Tool Co. Cincinnati, Ohio



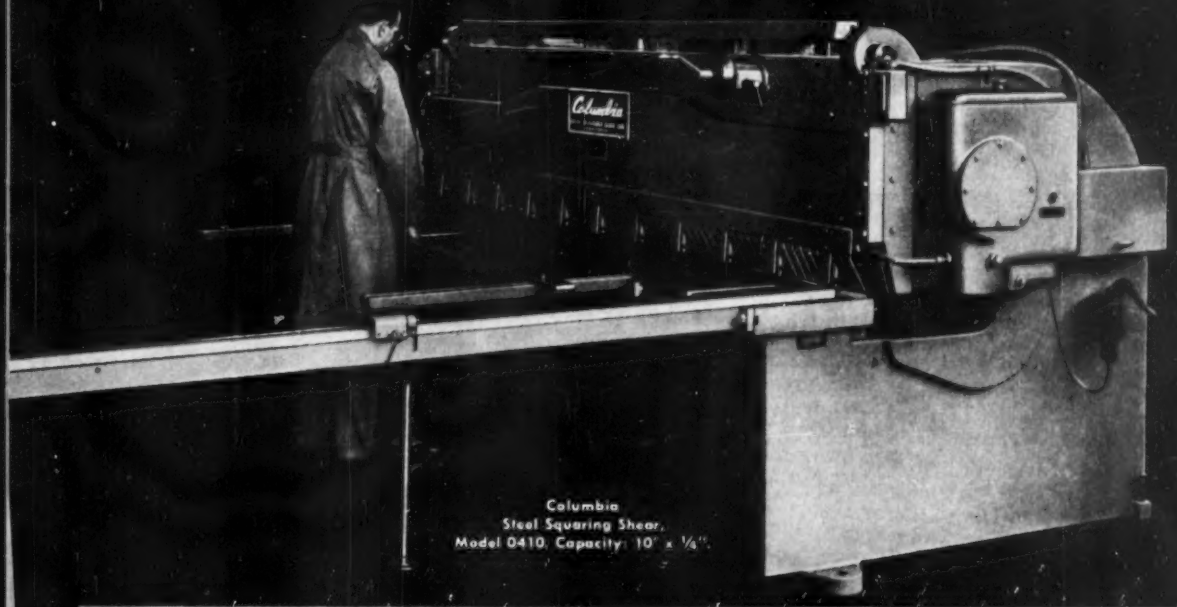
STEEL SQUARING SHEARS

TAILORED FOR YOU!

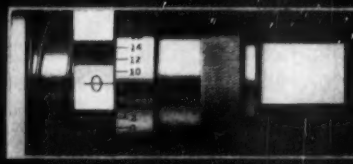
Columbia "New Series" steel squaring shears are quoted bare of all accessories. When you buy COLUMBIA *you* specify accessories which you will require, and you are charged *only* for the accessories which you specify.

In addition, the many exclusive features of Columbia Shears can be had in no other make.

The Blade Clearance Indicator, for example, makes blade clearance adjustment an "operator function." Simplifies and speeds quality shearing without the assistance of supervisory personnel. This new-found ease of making blade adjustments leads to accurate blade clearances regardless of how frequently material specifications change.



Columbia
Steel Squaring Shear,
Model 0410, Capacity: 10" x ¼".

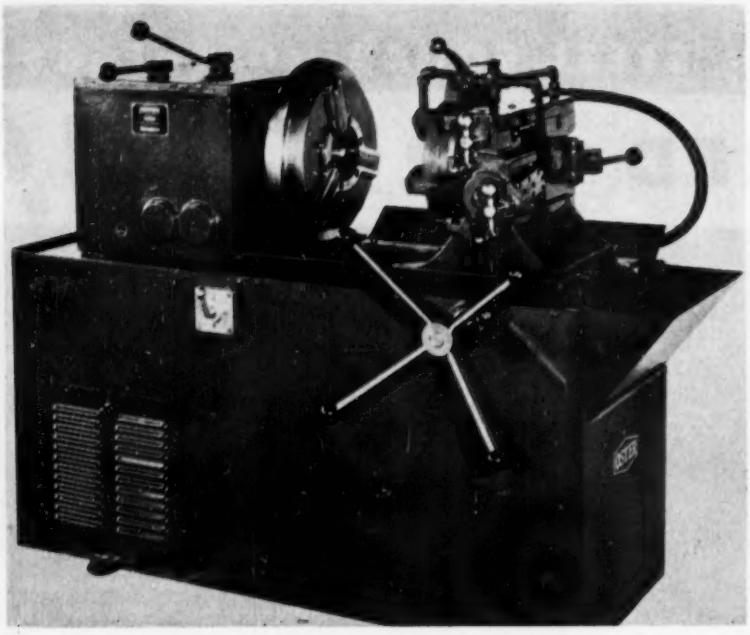


Blade Clearance Indicator—By means of this device, accurate blade clearances can be achieved by the shear operator. This eliminates the necessity for calling in supervisory personnel to make these simple adjustments.

Other exclusive Columbia features are explained in detail in our FREE Bulletin No. 5321. Write for it, and the name of your nearby Columbia Dealer, *today!*

Address: Columbia Machinery and Engineering Corporation, Hamilton 2, Ohio.

new series **Columbia** STEEL SQUARING SHEARS and POWER PRESS BRAKES



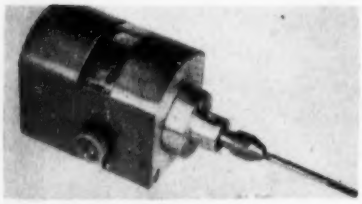
Oster Pipe-Threading Machine Has Four Spindle Speeds

Pipe-threading machine, termed No. 784 Thrift Model, is a floor machine with standard range of 1 to 4 in. and extra range of ½ and ¾ in. It is equipped with front chuck requiring no wrench and is said to be ideal for frequent changes of pipe sizes because spin of handwheel moves gripping jaws through entire range in few seconds.

Rear centering chuck is designed to be quick-acting and non-binding. Rear chuck, together with extra-long spindle, provides maximum pipe support, prevents whipping, and assures straight threads on long lengths.

Magnetic starter, with push-pull selector switch for run and jog controls the 1800-rpm, 3-hp motor. Four spindle speeds are controlled by lever. Two quick-opening detachable-lever die heads cover entire pipe and bolt range and are adjustable for over- and under-size threads.

The Oster Manufacturing Co, 2057 E 61st Pl Cleveland 3, Ohio

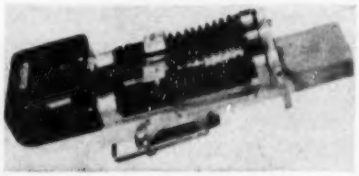


Chatillon Torsion Tester

Model N935 is shown testing point of torque at which two shafts will slip. Tester is built around Iso elastic spiral spring mounted on shaft which is seated in two precision low-torque bearings. Capacity is 40 g-cm and dial is graduated in increments of 2 g-cm. At full capacity, inherent frictional error due to bearings is ¼ g-cm.

With different springs tester can be made in almost any capacity. It can be designed to test clockwise or counter-clockwise torque, or both. Unit is operated by turning chuck with the fingers. Zero-setting adjustment is provided.

John Chatillon & Sons, 85 Cliff St, New York 38, NY



Buffing Compound Applicator

Air-operated buffing compound applicator, 600 Series, has been designed to feed any number of strokes per minute, applying compound only when required.

Available in four models to accommodate rectangular or round compound bars, the unit can be installed on all types of buffing machines from simple lathes to multi-operation automatics. The 18-lb weight permits installation on floating heads without disturbing balance, and in any position without affecting operation.

Device can apply compound only during buffing cycle, withdrawing while work changes from station to station. Eight applicators can be operated simultaneously from a single controlling valve; with each application, compound is fed forward to compensate for weardown of the bar. Rate of feed is adjustable from 0.0015 to 0.015 in. per stroke.

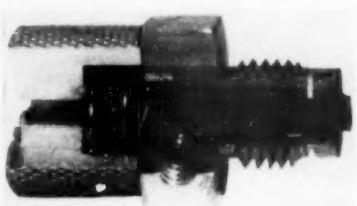
George L Nankervis Co, 19255 West Davison, Detroit 23, Mich

Carbide Cutting Life Increased by BK4 Process

Process for sintered carbide is said to increase cutting life from two- to ten-fold. Finish on machined parts is reported to be greatly improved. Process may be used on any grade of carbide on market and is done on weight basis only. BK4 does not merely impart a case-hardening effect, but penetrates entire volume while retaining its Rockwell hardness.

It is claimed that no change in grinding practice is necessary. Previously established speeds, feeds, and depth of cut can remain the same.

Harwil Ventures, 2746 W 59th St, Chicago 29, Ill



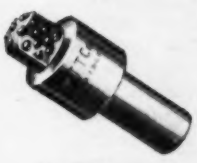
Bleeder Valves For Hydraulic and Pneumatic Lines

Designed for both hydraulic and pneumatic lines of any size or pressure, semi-automatic Greer-Lane valve is spring-loaded rotary type using channeled, knife-edged cap that uncovers bleed port with twist of external head. Internal spring snaps valve closed when head is released; knife-edge of bleed-port cap shears off and cleans out any contaminant caught at the bleed opening, assuring positive closure and seal. Bleed outlet port is threaded, allowing installation of hose to carry off bled fluid. Internal O-ring prevents leakage around connecting shaft.

Greer Hydraulics, Inc, 354 18th St, Brooklyn 15, NY

RADIUS FORMING TOOLS

"TRU-LINE" PROFILE DRESSING TOOLS



IMPREGNATED DRESSING TOOLS

STANDARD DRESSING TOOLS

"TRU-THREAD" THREAD DRESSING TOOLS

DIAMOND GRIT TOOLS FOR THREAD DRESSING

INDUSTRIAL DIAMONDS

The Charm of Booie, The Witch Doctor

Booie, the Kaffir witch doctor, didn't want to part with the charm. Often he had made big magic with it in his ceremonial dances and without it he might lose face. And, didn't it have miraculous powers?

Schalk van Niekirk, the old Boer trader, thought so—at least it had the power to make him a very wealthy man, for this pebble was four times the size of the one he had sold two years before.

So, all day long they haggled and Schalk brewed pot after pot of Dutch coffee, heavy with sugar, well flavored with a magical potion from a stone bottle and served it with the free hand of a man who feels a fortune tickling his fingertips.

Finally, he stood up, stamped out the fire and said, "Booie, come to my kraal and I will give you 500 sheep, 10 oxen, and a horse— I have nothing more." Booie held out his hand; suddenly, he was incredibly rich.

Schalk sold the big diamond—it weighed 83½ carats—for $56,000, a handsome fortune in 1870. In London, after cutting to 46½ carats, it proved to be of the finest color and brilliance, and the Countess of Dudley gladly paid $125,000 for it. In her tiara it became "The famous Dudley Diamond."

Diamonds are precious in industry, too, because they are still the greatest cutting element known to man. For 43 years we have been importing fine diamonds for our customers. Our field engineers are at your service.

WHEEL TRUEING TOOL COMPANY

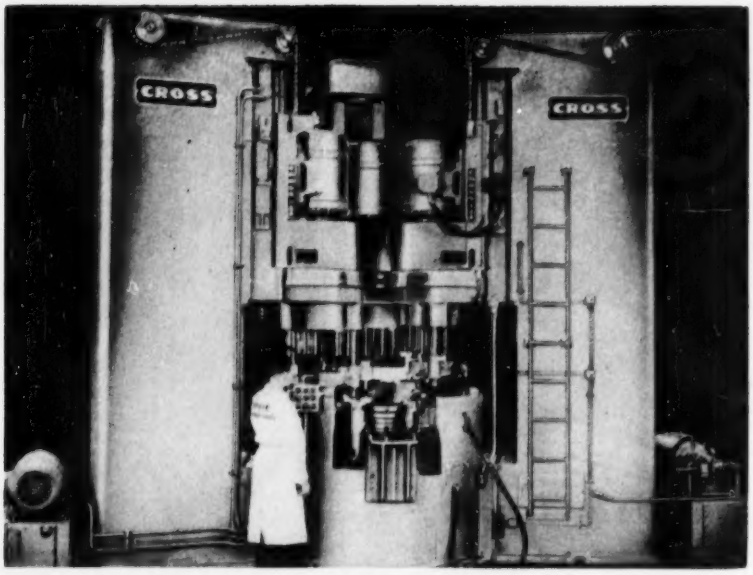
19-3200 West Davison Avenue • Detroit 6, Michigan

ESTABLISHED 1910

Offices in Principal U. S. Cities—Agents Throughout the World

WHEEL TRUEING TOOL COMPANY OF NEW JERSEY
33 West Street, Bloomfield, N. J.

WHEEL TRUEING TOOL COMPANY OF CANADA, LTD.
575 Langlois Ave., Windsor, Ont.



SPECIAL MACHINE for drilling and reaming Diesel locomotive cylinder heads at the rate of 50 per hr has seven stations: No. 1 for loading and unloading; No. 2 for drilling 13 holes; No. 3 for drilling 11 holes and spotfacing one hole; No. 4 for drilling 12 holes; No. 5 for drilling 2 holes, core drilling and chamfering 3 holes; No. 6 for reaming 9 holes, chamfering 6, and forming 2 spherical seats; No. 7 for reaming 9 holes, chamfering one, and forming 2 spherical seats. Unit has fluid motor driven index table, hydraulic feed and rapid traverse, hardened and ground ways, and automatic lubrication—*The Cross Co, Detroit 7, Mich*

Metablast Technique Repeats Predetermined Surface Finish

Metablast process applies theory that controlled surfaces are better than "supersmooth" surfaces to reduce friction, dissipate heat, and prevent moving metal parts from seizing, sticking, or burning. Process consists of shooting a specially developed abrasive suspended in liquid in a controlled high-pressure spray against a metal surface. Spray produces minute pits that can be varied in coarseness or fineness, as desired, by using different grades of Metablast abrasive, and changing length, force, or direction of spray. Tolerances are reportedly maintained to 0.0001 in.

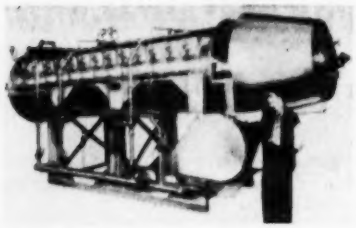
It is claimed that process allows predetermined surfaces to be obtained time after time without variation. Applications include casting molds of all kinds, dies for punching, stamping, and pressing operations, mating metal parts such as bearings and gears (minute wells also act as reservoirs for lubricant), tools, use as pre-treatment to prepare metal for painting, bonding, plating, and buffing, and for cleaning rust, scale, and old paint from metal.

American Metaseal Mfg Co, West New York, NJ

Stationary Seal Rings

Line of O-rings, made of Victoprene synthetic rubber compound, consists of 87 stock sizes from ⅛ x ¼ x 1/16 in. to 15½ x 16 x ¼ in. for either moving or non-moving seals, plus 52 additional listings recommended for non-moving sealing applications only.

Victor Manufacturing & Gasket Co, PO Box 1333, Chicago 90, Ill



Heat-Treating Furnace Has Three Separate Control Zones

AGF Model 139DR rotary retort heat treating furnace has three separate zones of temperature control. Operator can regulate temperature in any one of the zones divided about equally over the length of the furnace.

Separate areas permit on-and-off operation during idling periods, and high input when producing work. Readily controlled burners allow temperature variation in each zone for special heating needs. Pilot light at each burner facilitates lighting and inspection. Model has an improved sealing provision at discharge end.

Heated work space is 15 in. in diameter by 10 ft long. Production of non-ferrous metal parts is 1000 lb per hr, which can be regulated through the self-metering hopper and the variable speed of rotation. Weight is variable to suit temperature requirement; overall size is 16 ft long by 7½ ft high by 4½ ft deep.

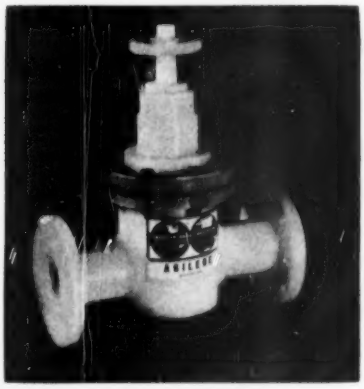
American Gas Furnace Co, 1006 Lafayette St, Elizabeth, NJ

Portable General Purpose Grinders Have One-Piece Shaft

General purpose grinders are an addition to Buckeye A series of air tools. Available with lock button or lever throttle, spindle grinders take 2-in. organic wheel and are offered with extension adapters for using mounted wheels.

Units weigh 1¾ lb and reportedly develop 50% greater hp than similar, larger tools. Both tools feature one-piece shaft design to eliminate replacement of expensive parts. Rotor floats on shaft, connected by two inexpensive keys replaceable when worn.

Buckeye Tools Corp, Div 15, Box 966, Dayton 1, Ohio



AGILENE POLYETHYLENE 1- and 2-in.-bore valves are lightweight and resist hydrofluoric, sulfuric, nitric, and hydrochloric acids at temperatures up to 160 F—*American Agile Corp, Box 168, Bedford, Ohio*

Many companies cut their costs with

Revere Electric Welded Steel Tubing

Available from ¼" to 4½" O.D. — Walls from .025" to .187"

A leading maker of appliances was using a heavy tubular member as a wringer post extension. With the collaboration of Revere Steel Tube engineers, the manufacturer developed a simple fabricated part of Revere Electric Welded Steel Tube, supplied ready for assembly. This reduced the thickness of the tube wall by half, cutting costs considerably and making the machine somewhat lighter and thus more attractive to users.

Revere offers you Electric Welded Steel Tube in the shapes shown here, and many others. The tube can be made so it is impossible to find the weld. Our Technical Advisory Service will gladly collaborate with you on applications to your product.

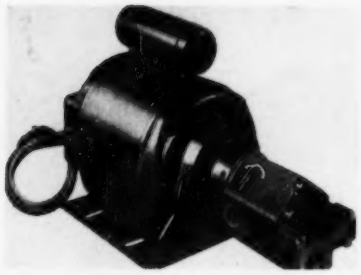
REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Distributors of Revere Electric Welded Steel Tube are: Austin Hastings Company, Inc., Boston, Mass. • Peter A. Frasse & Co., Inc., New York, N. Y., Philadelphia, Pa., Buffalo, N. Y., Syracuse, N. Y. • C. A. Roberts Co., Chicago, Ill., Detroit, Mich., Indianapolis, Ind., St. Louis, Mo., Tulsa, Okla. • Joseph T. Ryerson & Son, Inc., Cleveland and Cincinnati, Ohio, Pittsburgh, Pa., Los Angeles and San Francisco, Calif. • Peden Iron & Steel Co., Houston, Texas.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS



Low-Capacity, Low-Pressure Webster Hydraulic Pumps

Series LA and LB hydraulic pumps are available with integral electric motor drives for low-pressure, low-capacity applications. It is said that combination units may be readily adapted to pressure lubrication systems, oil circulating systems, oil filtering systems, lift systems, oil transfer and replenishing systems, and low-pressure hydraulic systems. Design permits use not only with oils but with other liquids having a substantial oil base.

Capacities range from 0.25 to 4.5 gpm at 100 psi. Max working pressures may be increased to 200 psi with power requirements not to exceed ½ hp. Optional internal relief valves make it possible to vary relief pressure between 50 and 200 psi with manual adjustment.

Oil Hydraulic Div, Webster Electric Co, 1900 Clark St, Racine, Wis

Exhaust Ventilators Are Corrosion-Resistant

Corrosion-resistant exhaust ventilators for use in industrial plants and laboratories are fabricated from Agilide (unplasticized polyvinyl chloride) which reportedly offers high structural strength and chemical resistance to most corrosive vapors.

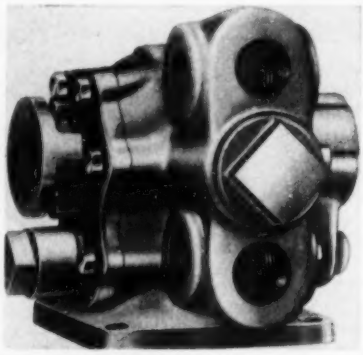
Units are of all-welded construction and available in four sizes ranging from 250 to 1670 cfm. They are furnished with motor, completely mounted on steel ventilator and motor base.

American Agile Corp, PO Box 168, Bedford, Ohio

Steel Surface Protection

Formula No. 50 for surface protection of iron and steel can be used over rusted surfaces after removing loose scale. Galvanic action takes place through the rust; electrical continuity produced between steel and coating prevents rust creep. Product is applied with paint brush or spray gun, dries in an hour. One gallon, which covers 500 sq ft, is priced at $23.50; half-pint, $2.25, quart, $6.50.

Constad Laboratories, 120 W 28th St, New York 1, NY

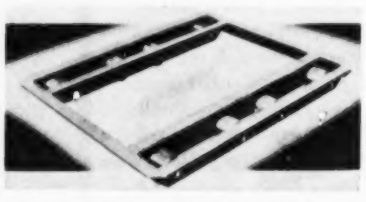


Four-Way Hydraulic Valves Designed for 300 to 1500 psi

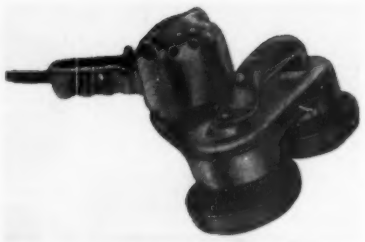
Type 555-RO four-way hydraulic valves are said to provide a reliable self-contained valve for positioning double-acting hydraulic cylinders or hydraulic motors. Design pressures lie between 300 and 1500 psi; valve is not suitable for pressures over 1600 psi. Operating fluid is No. 10 SAE motor oil or hydraulic oil of equal viscosity.

Capacity is approximately 400 gpm at 1500 psi. Body and rotary valve are of cast special alloy; check and relief valves and seats are of special hardened stainless steel alloy. Operating lever can be furnished by user to suit individual requirements.

A W Cash Co, Decatur, Ill



SWIVEL KING PALLET ROLLERS have equalizer design to retain parallelism under all conditions. Rolls are heavy-gage and have large diameter and crowned ends. Frame is high-tensile strength steel, welded construction— *Frank L Robinson Co, Latham Square Bldg, Oakland 12, Calif*



Sander-Polisher Equipped With Two Counterbalanced Heads

Translatory action sander-polisher for sanding, filling, feathering, and polishing metals, enamel, and other surfaces, is equipped with two counterbalanced heads to eliminate all centrifugal force. Fine hand-finish is said to be produced without swirl marks, scuffing, or burning.

Special cups are available for all types of grinding, smoothing, and polishing of base metals and other raw surfaces. Regular wiping cloths, chamois, or lambs wool, may be used for final finishing on enamel, wax, and other high-gloss surfaces. The 8-lb unit is available in either electric or air-operated models.

Cyclo Manufacturing Co, 2140 South Delaware St, Denver Colo

Electric Mountable Handtool Turns at 45,000 rpm

Electric handtool is said to have sufficient speed, power, and precision to operate tungsten carbide midget mills as well as other rotary tools for grinding, milling, finishing, and polishing within a range from 3/32 to 3/16 in. in shank diameter. For precision internal grinding and milling with rotary tools, Precise wheel arbors are available in ⅛-, 3/16-, and ¼-in. sizes.

Driven by 1/5-hp universal motor, one-piece dynamically balanced spindle turns at 45,000 rpm and with speed control can be reduced to 15,000 in stages.

Unit is air-cooled and said to be vibrationless. Spindle turns on two microprecision sealed ball bearings. Motor is protected against overload by built-in Fusetron, and two automatic brush stops shut off power when brushes need replacing.

Tool weight is 35 oz and diameter at chuck nose is ½ in.

Precise Products Co, 1328 Clark St, Racine, Wis

*REO DESIGN ENGINEERS SAID...

TOUGH JOB?

WE'LL SPECIFY

STRESSPROOF®

SEVERELY COLD-WORKED, FURNACE-TREATED STEEL BARS

AGAIN!

Reo Motors, Lansing, Mich., have again specified STRESSPROOF—this time for the power shaft on their new rotary lawn mower.

Another
Reo Lawn Mower to Use STRESSPROOF

Reo engineers needed *top performance* from this new drive shaft . . . so they insisted on STRESSPROOF! They knew from years of successful experience with STRESSPROOF that it could take abuse. It had both the strength and wearability to stand up under the toughest service—and its excellent machinability was most welcome from a cost standpoint.

The alternative to STRESSPROOF would have been a heat-treated part, with the attendant cleaning, straightening, and machining problems.

Only STRESSPROOF gives you a unique combination of four qualities *in-the-bar:* Strength, Wearability, Machinability, and Minimum Warpage. Yet it costs less than the other quality cold-finished steel bars.

STRESSPROOF makes a better part at lower cost! It is available in cold-drawn or ground and polished finish.

SEND FOR . . .
Free Engineering Bulletin
"New Economies in the Use of Steel Bars"

La Salle STEEL CO.

Manufacturers of the Most Complete Line of Carbon and Alloy Cold-Finished and Ground and Polished Steel Bars in America.

La Salle Steel Co.
1416 150th Street
Hammond, Indiana

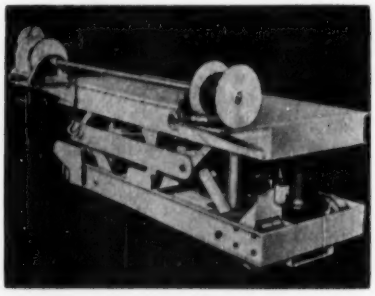
Please send me your STRESSPROOF Bulletin.

Name _____
Title _____
Company _____
Address _____
City _____ Zone ___ State _____

Bin Unit Shelves Adjust Vertically

Lyon bin units have vertically adjustable shelves to make space available for items of all sizes. Several models of bins are available offering different divider arrangements to provide various sized openings. Some bins also come with shelf boxes, especially designed for small quantities of small parts. Units are 3 ft wide, 1 ft deep, and 6½ ft high.

Lyon Metal Products, Inc, Aurora, Ill



Winch Converts Table into Die-Handling Unit

To facilitate handling of heavy dies, Raymond Corp has designed winch and cable arrangement to mount any of company's tables. Table thus does double duty—keeps stock elevated to correct feeding height, acts as die-changing device between production runs.

Gear reduction of 96 to 1 makes manual operation possible for drawing dies weighing up to 5 tons. Two reels, holding 15 ft of cable, are mounted at end of table and connected by shaft.

Dies can be drawn from or placed in press by two-way operation of winch. Straight pull is made to remove dies; cables are run around pulleys to transfer die from table to press.

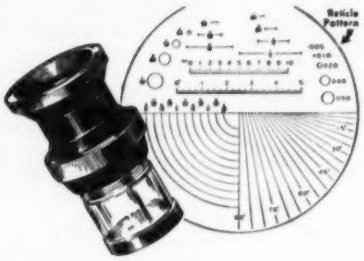
Full working surface of table is available for sheet feeding because winch is mounted on brackets extending beyond sides.

The Raymond Corp, 4108 Madison St, Greene, NY

Emulsion Deodorant

Industrial deodorant called Rance-Rid has been developed for treatment of rancid and odorous coolant and cutting oil emulsions. Single application is reported to restore unfit solutions to original condition; prevents rancidity if added while emulsion is still fresh; added at regular intervals it permits indefinite use of emulsions. One ounce of powder, available in 1-, 5-, and 25-lb cartons, treats up to 20 gal.

Hersen Chemical Co, 825 Fisher Bldg, Detroit, Mich



Pocket Comparator Checks Small Parts

Pocket comparator, 1½x2 in. in size, gives 6X magnification. Reticle is calibrated to measure angles, radii, circular and linear dimensions in both decimal inches and millimeters. Price: $22.50.

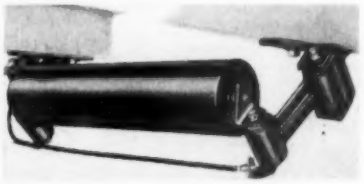
Edmund Scientific Corp, Dept 211, Barrington, NJ

HYPRESSURE JENNY STEAM CLEANER delivers full-power blast 90 sec after cold start. Vapor spray output is 90 or 120 gph. Zippered canvas cover protects unit — *Hypressure Jenny Div, Homestead Valve Mfg Co, Coraopolis, Pa*

Roller Bearing Functions Under Misalignment Conditions

Self-aligning, torque-tube type, double-row roller bearing is said to provide full freedom of rotation under all conditions of misalignment resulting from mounting inaccuracies or flexing of airframe structural members during flight. Bearing is factory lubricated and equipped with positive seals which retain lubricant and prevent air loss in pressurized aircraft. Other features claimed are simplicity and compactness which produce a high-capacity, light-weight bearing of fewer parts with minimum cross-section dimensions.

Shafer Bearing Corp, Downers Grove, Ill



Belt-Training Return Idler Provides Automatic Alignment

Rex style 41 roller-bearing belt-training return idler provides automatic alignment for return belt without use of side guide idlers. Idler consists of dead-shaft roller-bearing return roll, mounted at each end to toggle-like arrangement of swivel arms suspended from conveyor framework at an angle of approximately 45° in direction of belt travel.

Lateral movement of belt results in shift of weight which guides belt back to central position. Because of principle of operation, idler operates in one direction only.

Style 41 is furnished with standard 5- or 6-in.-dia steel return rolls; 41RC has standard 5½-in.-dia rubber-covered spiral return roll.

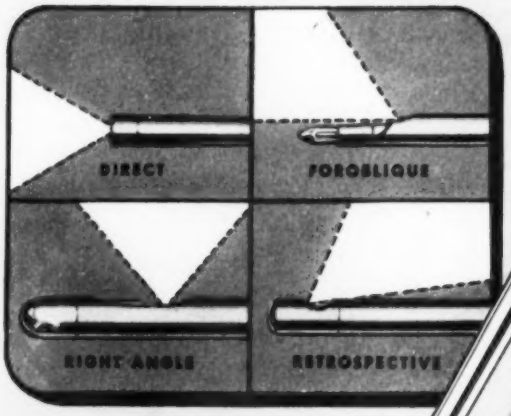
Chain Belt Co, Milwaukee 1, Wisc

INSPECTION OF CONFINED AREAS FACILITATED

NECESSITY OF DISMANTLING AVOIDED

TIME SAVED—MONEY SAVED

A.C.M.I. BORESCOPES



A.C.M.I. Borescopes are available in 4 angles of vision (as above)—in diameters of .120" to 4.00"—in lengths of 4" to 720". Special models for special problems.

The A.C.M.I. Borescopes permit close-up visual examination of interior areas and surfaces not otherwise visible. They save time and money, and prevent costly dismantling, by providing a practical solution to a wide variety of inspection problems.

In maintenance and inspection work, on small internal bores, machine parts or castings, to large boiler tubes, chemical plants, process equipment, or other industrial installations, an A.C.M.I. Borescope may be the answer to *your* problem.

Each Borescope is a compact, self-illuminated industrial telescope of highest quality, employing a precision optical system, that produces a flat visual field. Lens systems are fully corrected for color, spherical aberrations, and coma, with all lens surfaces coated to increase light transmission.

Write for free informational folder, or tell us your problem.

American Cystoscope Makers, Inc.

1241 LAFAYETTE AVENUE **NEW YORK 59, N. Y.**

Compact Continuous Tube Mill Has Double Enveloping Gearing

Electric weld tube mill, designed and built by the Herr Engineering Co of Warren, Ohio, produces a wide variety of sizes and types of tubing. Unit forms flat stock, welds the joint, burrs the seam, and sizes the tube in one continuous operation. It has ten roll passes, six in the forming section, and four in the sizing section.

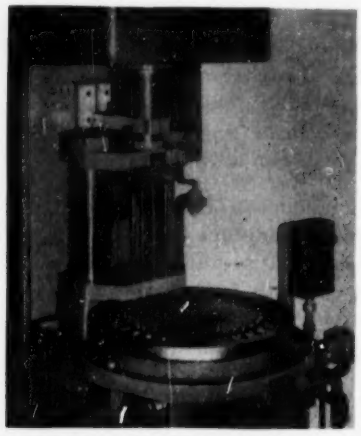
Short center distance of 11¼ in. between roll stands, greatly reducing overall length of the mill, is made possible through use of Cone-Drive double enveloping gearing which permits carrying of higher loads on smaller center distances in the ten speed reducers used in the drive system.

Small 2-in. center distance of reducers nearly equals that of the rolls, permitting universal joint assemblies to be almost parallel to each other. This is said to provide an unusually smooth drive and reduces overall height of rolling units.

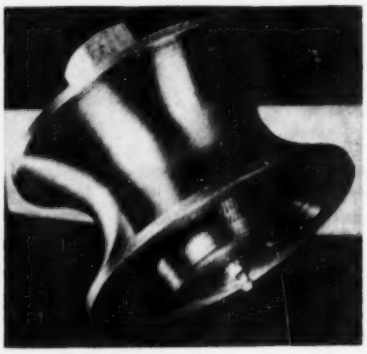
Inside the cast iron housing of the 85-hp, 20/1-ratio reducers are two worm gears mounted on single-extended output shafts above and below a worm. Worm has a double-extended integral shaft, enabling input shafts of adjacent reducers to be coupled together with flexible couplings.

Power is transmitted to both banks of reducers from a 7½-hp, adjustable speed motor. Cone-Drive reducers permit a three-shaft output from a single-shaft input; power is transmitted through speed reducer to both rolls and the next reducer.

Cone-Drive Gears Div, Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich



CONTINUOUS STRIP-BROACHING AND BURNISHING of 1800 automotive rocker arms per hr is achieved on 10-ton, 36-in. stroke press. Arms are broached four at a time with 0.010 in. stock removed. After broaching, arms drop through table slots and travel through chute into container—*Colonial Brooch Co, Box 37, Harper Sta, Detroit 13, Mich*



Conveyor Belt Guide Prevents Ripping, Tearing

Guide for conveyor belts, designed to protect belt edges from ripping and tearing, is being marketed by Knapp Mills. The Norwegian device is called a Guidler, because it serves as an idler as well as a guide. In addition to returning belt to proper course without injury, the guard can also be used to control a belt within narrow distances of movement.

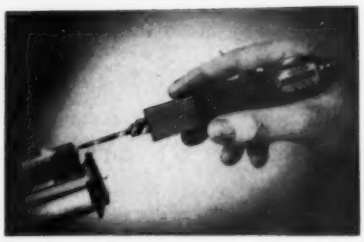
Installed at a 30° angle, the revolving face, hyperbolic to the belt edge, distributes the force of impact over a relatively long, flat surface, avoiding injury to the belt edges. Guidler also moves along its axis, following the vertical movements of the edge, controlling it while rising. Three models are available, designed to cover the majority of belt-guide problems.

Knapp Mills Inc, 23-15 Borden Ave, Long Island City, NY

Compressor Has Valve Spring

DeVilbiss V-type air compressors are equipped with a valve spring arrangement which increases speeds. Concave surfaces of two curved pieces of Swedish spring steel are installed in opposing relations; no failures have been reported during more than two years of service life.

DeVilbiss Co, 300 Phillips Ave, Toledo 1, Ohio



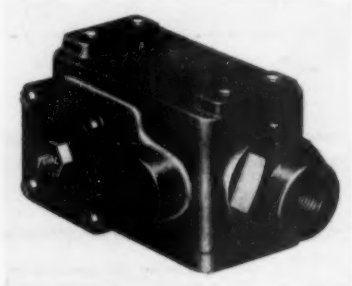
English Gages Check Spring Tension

Spring tension, or the resistive force of any device that opposes motion, can be checked with one hand by means of G E C tension gages. Force range is from 4 to 2500 grams.

Gage is preset to required tension by knurled micrometer screw and the end of the gage operating strip applied to the point at which opposing force is to be checked. Deflection of the operating strip, at the same time the resistance element moves, indicates that the opposing force is equal to gage setting.

Gages are precision calibrated with adjustable zero correction. Knife-edge bearings provide negligible friction and gravitational effects are said to be accurately counterbalanced. Six models have the following ranges: 4 to 24, 10 to 80, 50 to 250, 100 to 500, 200 to 1600, and 500 to 2500 grams.

Imported by Imtra Corp, 58 Charles St, Cambridge, Mass.

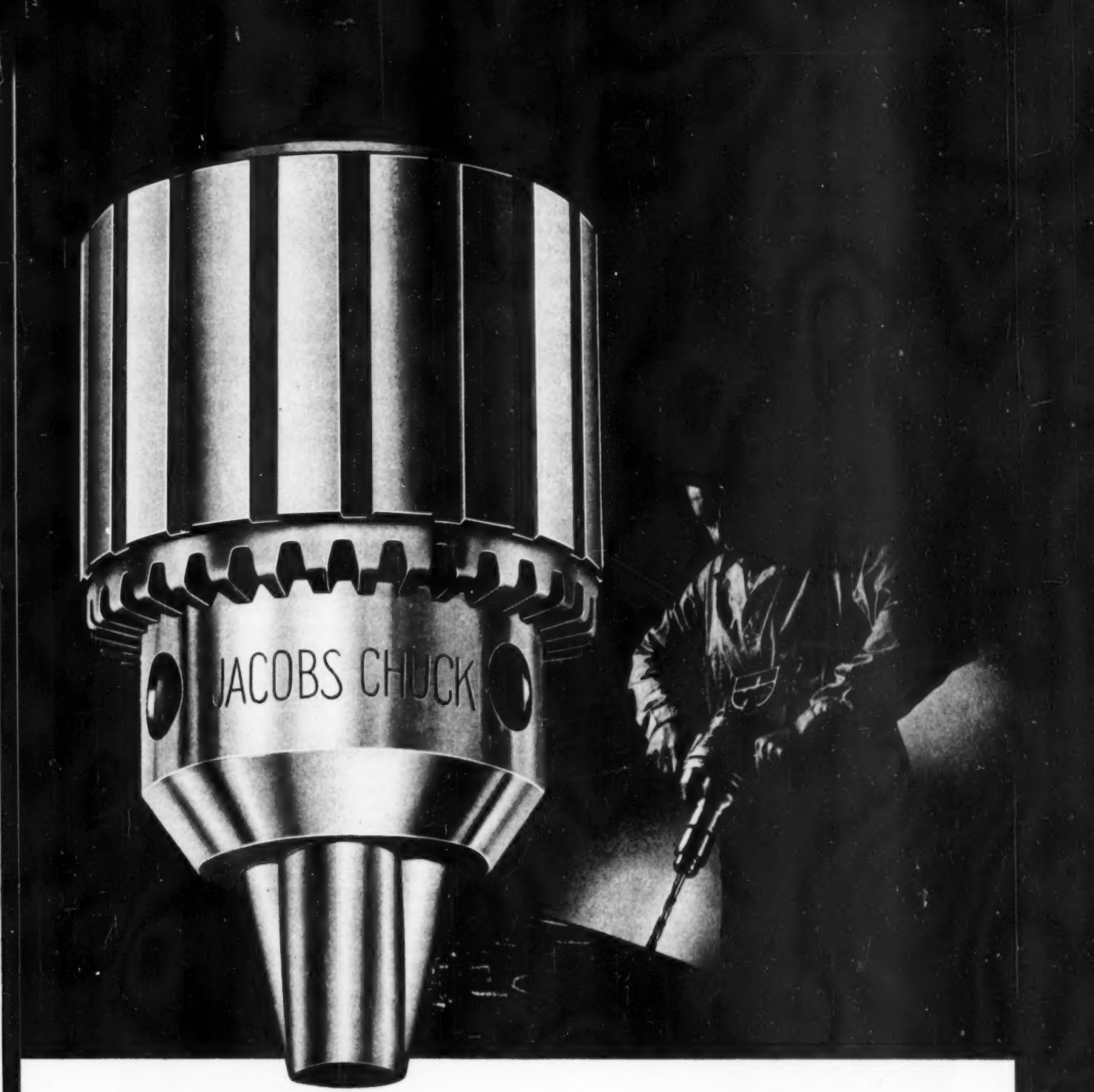


Aro Pressure Regulator Weighs 8 oz

Model 10700 pressure reducing regulator for air systems is claimed to be one half the weight and one fourth the size of comparable regulators. Unit weighs 8 oz and measures 1⅝-x1-15/16x2-21/32 in. Maximum inlet pressure is 2000 psi and output pressure is adjustable from 50 to 300 psi.

Flows up to 300 liters per minute are possible with 15% output pressure variation from zero to full flow. Higher output flow is possible with larger pressure variation.

The Aro Equipment Corp, Bryan, Ohio



TIGHTEN YOUR GRIP ON PRODUCTION

Production flows faster and smoother when your machine tools are equipped with Jacobs Chucks.

Rugged construction, great gripping power and accuracy have made The Jacobs Plain Bearing Drill Chuck the choice of machinists throughout the world.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

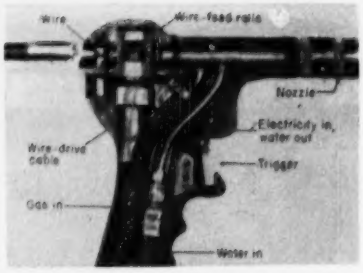
IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

. . . first in service



G E Equipment for Consumable-Electrode Gas-Shielded Welding

It is reported that the high-speed metal deposition provided by Filler-arc apparatus enables operator to more than double output on applications where filler metal must be added. Electrode wire of aluminum, stainless steel, mild steel, copper, magnesium, and other alloys may be used with argon or helium shielding gas. Aluminum may be welded in thicknesses from 1/32 to 3 in., stainless steel from 1/16 to 1 in.

Equipment consists of three main components: special self-regulating motor-generator type welder, pistol-like holder, and an electronic wire-drive unit.

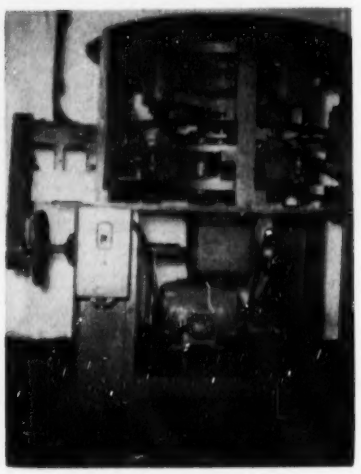
Welding generator, rated at 450 amp, has rising volt-amp characteristic and will supply current necessary to melt wire at exactly the rate at which it is fed. Machine settings are for arc length only. Wire-feed rate, only other variable, can be changed while welding.

Gun contains knurled feed rolls for pulling electrode wire from spool mounted in wire drive unit, trigger to control wire feed and gas flow, and electrical contact tip. Wire from 0.030 to 0.093 in. in dia can be handled. Wire-feed rate can be adjusted from 0 to 750 ipm by remote two-speed switch. Fingertip control makes welding possible without holding trigger depressed.

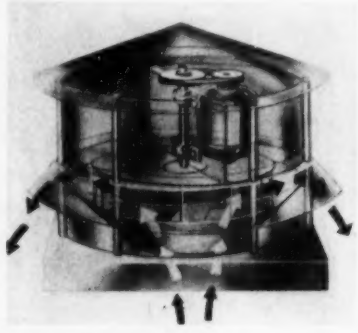
Wire-feed drive motor control powers knurled feed rolls in welding gun through flexible shaft. Incorporated is voltmeter for indicating wire-feed speed in ipm, arc voltage, a gas solenoid valve, control relays, and spindle for electrode wire.

Spindle handles spool- or rim-wound wire up to a mile long and has solenoid brake to prevent reel over-running. Dynamic braking controls wire projecting from nozzle at end of weld so correct amount is available for next start.

General Electric Co, Schenectady 5, NY



FOUR-SPINDLE BEADING MACHINE for thread-rolling and contour-shaping operations features 5-in.-dia work capacity, spring-loaded pressure control, all-rotary motion, and use of standard forming tools — *Steiner Machine Co, 1014 Washington St, Hoboken, NJ*



Power Roof Exhauster

Belt-driven power roof exhauster develops up to 4-in. static pressure and up to 65,000 cfm. Unit, which can be installed without penthouse and extra ductwork, is designed for scroll effect operation. Air seal-off develops negative air pressure around motor shaft, preventing explosive or corrosive fumes from entering motor housing.

Exhauster has weather-proof, umbrella style outlet and all-welded, backward-curved centrifugal fan wheels.

Gallaher Co, 4108 Dodge St, Omaha, Neb

Fork Lift Hoist Protector

Tubular steel hoist protector, especially recommended for installation on all fork lifts trucks used in scoop operations, shields lift plunger from pitting and scoring by abrasive agents. Device telescopes upward or downward to match movement of plunger.

Towmotor Corp, 1226 E 152nd St, Cleveland 10, Ohio

Load-Revolving Mechanism Designed for Fork Trucks

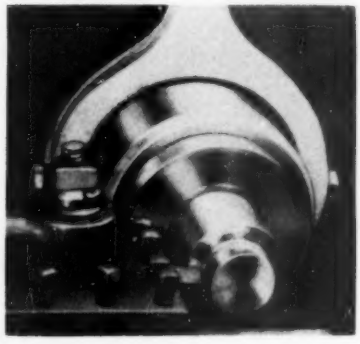
Elwell-Parker has designed a hydraulically operated load-revolving mechanism for its hydraulic fork truck line. Unit permits 360° rotation. Stationary housing of attachment is fixed to load elevator plate of truck. Rotating base, to which is fastened the desired load-supporting device, is mounted on the stationary base. Two large-diameter taper roller bearings permit base to rotate freely yet provide stable support for cantilever load.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio

Identification Markers

Speedy MARX identification markers are available printed in a new, easy-to-read type. Standard code cards include solid numbers, solid letters, and combinations of both, sequence numbers and letters, as well as standard electronic and electrical terms.

North Shore Nameplate Co, Glenwood Landing, LI, NY

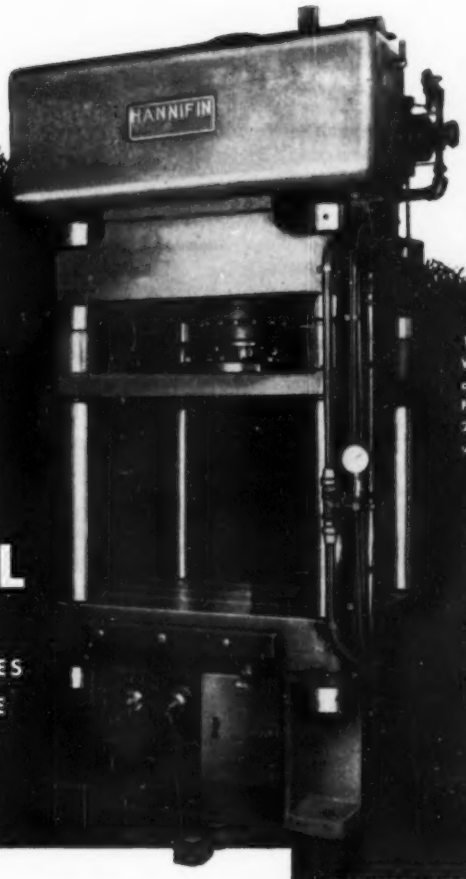


Adapter Nut for Hall Collet Chuck

Adapter nut is designed to adapt Hall model B-2 collet chuck to L-00 taper spindle lathes. Hall push-out-type collet chucks are said to have maximum over-capacity with positive automatic adjustment. It is not necessary to stop lathe to reset work.

Price of adapter nut is $175.

Hall Mfg Co, 622 Tularosa Dr, Los Angeles 26, Calif



150-TON FOUR-COLUMN PRESS—Semi-automatic cycle. Advance at high speed, feed stroke starting at pre-set point in stroke and automatic reversal. Self-contained unit with reservoir, hydraulic pumps and control valves on top of press. Dual electric push buttons.

IT'S ALL A MATTER OF CONTROL

HANNIFIN HYDRAULIC PRESSES CAN BE EQUIPPED WITH THE *CONTROLS YOU NEED*

15-TON FORCING PRESS—With built-in hydraulic power unit and exclusive, patented Sensitive Pressure Control. Gap 22", stroke, 21", reach, 10", table, 19" x 22" with U slot.

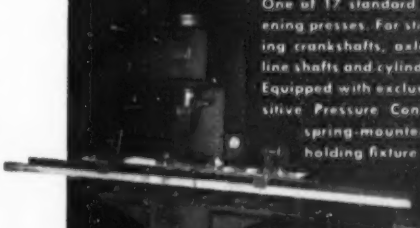
When you select a hydraulic press to do a certain job—*it's the control that's all-important.* Here Hannifin excels . . . for Hannifin Hydraulic Presses are supplied with many types of control.

One outstanding Hannifin development is patented Sensitive Pressure Control . . . standard equipment on Hannifin straightening and forcing presses. But Hannifin also offers conventional manual control, adjustable for maximum pressure, and a wide range of electric push button controls. Rapid advance followed by slow feed stroke, automatic reversal on time, pre-set pressure, or distance, all are available when needed. Ram speed control can be supplied as an optional extra feature with any of these controls, and cycling can be automatic or semi-automatic.

Chances are you can select the right press, and the type of control you need, directly from Hannifin's catalog . . . it lists more than 75 models, capacities from 1 ton to 150 tons. However, if your requirements are special, a Hannifin Field Engineer will analyze them, then recommend the exact control, or combination of controls, to do the job. Why not consult with him? Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

HANNIFIN'S NEW HYDRAULIC "HAN-D-PRESS"—For small part assembly operations. Available in 1-ton and 2-ton sizes with pressure adjustable. Stroke, 6", reach, 6", gap, 10". Speeds: (1 ton) 400 ipm, advance; 800 ipm, return. Dual manual controls standard.

35-TON OPEN GAP STRAIGHTENING PRESS—One of 17 standard straightening presses. For straightening crankshafts, axle shafts, line shafts and cylinder stock. Equipped with exclusive Sensitive Pressure Control and spring-mounted, work-holding fixture on 160" rails.



WRITE FOR BULLETIN 130

Hannifin Corporation
1117 S. Kilbourn Ave., Chicago 24, Illinois
Please send me Bulletin 130 on Hannifin Hydraulic Presses

Name.....

Title.....

Company.....

Address.....

City.....*State*.....

Hannifin Representatives Are at Your Service In These Leading Industrial Centers

Atlanta, Buffalo, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Houston, Los Angeles, Milwaukee, Minneapolis, Moline, New Orleans, New York, Philadelphia, Pittsburgh; Richmond, Va.; Rochester, N. Y.; St. Louis; Seattle; South Bend, Ind.; Washington, D. C.; Worcester, Mass. In Canada: TEM Sales Company, Limited, Toronto and Windsor.

HANNIFIN

Hydraulic Presses • Pneumatic Presses • Hydraulic Riveters
Hydraulic Cylinders • Air Cylinders • Air Control Valves

Full Side Chip Clearance Claimed for Slitting Saw

Nelco slitting saws are designed with heavily reinforced bodies to ease shearing stresses and prevent shattering at high speed. Alloy steel bodies are built out to width of teeth to minimize vibration and assure true running.

Saws feature overhanging carbide tips to eliminate need of grinding both steel and carbide when resharpening. Maker claims that quick, free chip removal is afforded by full side chip clearance assuring cooler operation and score-free finishes. Saws have accurately ground hubs and precision-honed holes. Electroplating process color codes the saws for ease of identification and also protects cutter body and prevents rust.

Nelco Tool Co, Manchester, Conn

25,000 rpm Obtained From Precision Power Tool

Selectric power tool designed for smoothing, drilling, polishing all types and hardnesses of metals, is 6 in. long, 1⅝ in. in dia, and weighs 16 oz. High-speed universal motor features seven bar commutator, dynamically balanced armature, double-shielded ball bearings, and vacuum-impregnated coils.

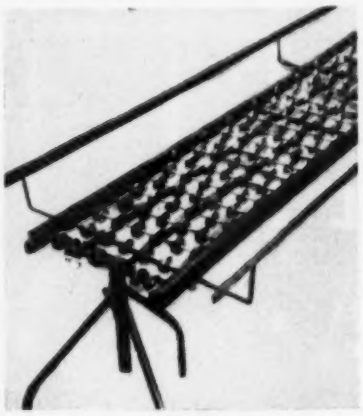
Tool comes in self-locking transparent plastic case with 40 accessories including polishing wheels, slitting saws, drum sanders, brushes, cutoff disks, felt polishing wheels, burs, and cutters. Price: $29.95.

Selectric, Dept Yu, Lynwood, Calif

Marking Tape

Labelon plastic tape is now available for marking by typewriter. Flat labels, bound in tablet form can be written on with any dry, blunt, point, as well as with typewriter. Each sheet is approximately 3¼ x 11 in.; six widths are available, 5/16, ½, ⅝, ¾, 1, and 1½ in. Number of typed lines possible ranges from 1 in the 5/16-in. width to 5 in the 1½ in. Tablets retail for $1.15.

Labelon Tape Co, 450 Atlantic Ave, Rochester 9, NY



Sage Gravity Wheel Conveyors Have Adjustable Guard Rails

Guard rails on conveyors are adjustable up to 5 in. on each side and adjustments are made by handscrew clamps. Seven ¼-in. precision carbon steel balls in each wheel revolve on hardened steel raceways and cones. Wheels revolve on special high-carbon, cold-rolled steel axles.

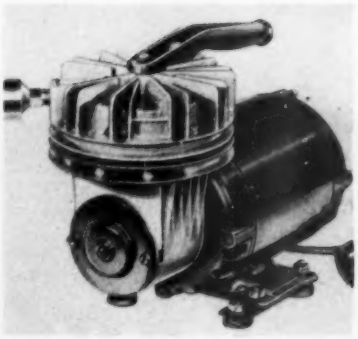
Conveyors with adjustable guard rails are made in standard widths of 12, 14, 18, and 24 in. with 6 to 36 wheels per foot.

Sage Equipment Co, 30 Essex St, Buffalo 13, NY

Machine Set-Up Kit Saves Time, Cost

Kit is designed to save time and cost on setup. Heavy-gage-steel holder contains 24 studs, 4 extension nut couplers, 4 flange nuts, 4 T-slot nuts, and 4 strap clamps with stud diameters available in ⅜, ½, ⅝, and ¾ in. with different T-slot nut sizes available for each stud dia.

Jergens Tool Specialty Co, 712 E 163 St, Cleveland 10, Ohio

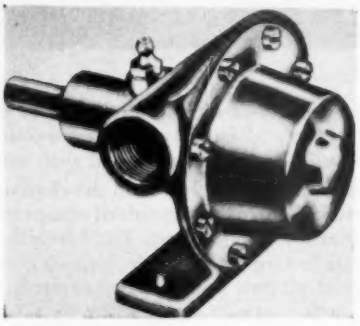


Air Compressor Provides Continuous Volume to 3½ cfm

Modernair compressor does not require a tank and has maximum operating pressure of 100 psi. Air devices may now be individually furnished with pressure at a production station, jig, or outdoor location without necessity of running expensive piping from plant stationary air supply, within compressor capacity. No pop-off valve or lubrication is required.

Unit weighs 40 lb. Motor is 1/3 hp, 115/230 v, with overload protection switch and capacitor.

Modernair Corp, San Leandro, Calif



Impeller Pump Equipped With Protective Cover

Neovane rubber impeller pump is made with a tapered, elliptically shaped cover designed to eliminate sudden impact on encountering cam portion. This is said to increase impeller life and quietness even at higher than normal speeds, and permits a full ¼ of the revolution for intake, ¼ for exhaust, and ½ for pressure build-up.

Impeller is attached to the stainless steel shaft by a brass pin; molded-in metal sleeve, completely rubber encased, strengthens impeller hub. Cover is made of heavy brass, easily removable for inspection or replacement; outer cover provides support for shaft and impeller.

Lee Healey Co, 554 West Garfield, Glendale 4, Calif

TAP-ODDITIES

Pete is only human
When it comes to judging beauty.
What's a thousandth — plus or minus
When you're measuring a "cutie"!

But when it comes to tapping —
Pete's judgement's plenty steep.
Bath Taps win — because their beauty
Is more than just "skin deep"!

INSIST ON BATH TAPS
—PROFIT BY THEIR
PLUS—PERFORMANCE

There's an intrinsic value to **Bath Taps** that cannot be seen from the outside.

We do not expect you to appreciate the time and effort put into the design and manufacture of these fine, precision cutting tools — but, we do know that Bath standards for quality pay off in tap performance. Our customers tell us so!

Right from the careful selection of steel — through the heat treating and grinding from the solid — to the final tap operation . . . quality control methods assure uniformity and accuracy.

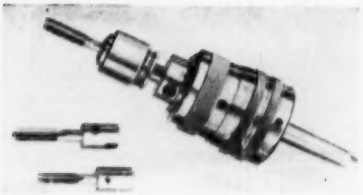
Bath Taps are "beauties" to look at — but, you'll also find they have the "stuff" to justify first place in your threading requirements.

Whether it be stock or custom built taps . . . insist on BATH TAPS for BETTER THREADS.

JOHN BATH CO. INC. · WORCESTER · MASS

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.



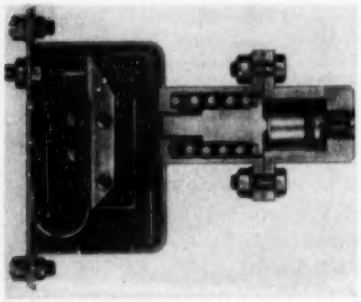
High Torque Accuracy Claimed For Tapping Attachment

Swedish precision-made tapping attachment was designed to reduce tap breakage and cut costs. Torque accuracy is said to be extremely high. The torque is transmitted through a sensitive disk clutch and control is obtained by turning sleeve in either direction. Sleeve is graduated so operator can set required torque for consecutive tapping of various size holes.

Device is equipped with quick-change chuck. When tapping, tap rotates at spindle speed; when reversed, it retracts at double speed.

Each attachment is supplied as standard with Morse taper No. 2, but other tapers are available. Tap holders vary from 5/32 to 9/16 in.

Imported by Homestrand, Inc, Larchmont, NY



Heavy-Duty Pressure Switch

Model 9612 heavy-duty switch is said to be capable of sensing any system pressure over an adjustable range from 15 to 3000 psi and actuating an electrical circuit on increasing or decreasing pressure; proof pressure to 7000 psi. Piston-type sensing element is not subject to fatigue, and is recommended for applications where millions of cycles are expected of the switch.

Basic body kit may be converted to changing service requirements by means of interchangeable fitting kits. Mounting bracket fits around neck of the unit and may be rotated a full 360° as well as moved up and down. Switch may be mounted in any position, and is insensitive to vibration or line surges.

Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58, Calif

Magnetic Sweeper Has Neoprene Nylon Cover

Rotating magnetic sweeper has 1½-in. clearance under the 8-in.-circumference housing. Magnetool is unloaded by stripping off thin Neoprene Nylon cover from which the accumulated tramp iron is poured into collection box attached to frame.

Product is claimed to have largest capacity of any sweeper per pound of weight, foot of width, or dollar of cost. Starting at $175 for the 22-in., 16-lb size, it is offered in standard widths to 6 ft. Unit may be pulled or pushed manually by the 56-in. handle or attached to any vehicle.

Multifinish Mfg Co, 2114 Monroe, Detroit 7, Mich

Metal Belt Conveyors Handle 16-ton Loads

Armorbelt metal belt conveyors have been designed to carry loads ranging from a few ounces up to 16 tons. Entire belt runs on protected ball bearings; individual metal link construction eliminates tracking problems. Conveyor can be converted to a production line by bolting or welding jigs and fixtures to the steel belt links.

Horizontal units are furnished for both standard and heavy-duty applications in widths from 6 to 120 in., and lengths up to 200 ft. Inclined or vertical models are available for floor-to-floor conveying of articles weighing as much as 1000 lb each at speeds up to 20 packages per minute.

Accessories include side leaves and tables, cleats, vertical bends, diverters, corner rollers, and gravity spurs.

M-H Standard Co, 515 Communipaw Ave, Jersey City 4, NJ

Small Parts Cleaner

Jiffy parts cleaner for small items is a five-jet agitator unit with 12 ports which admit compressed air in such a way as to set up a turbulence pattern activating entire volume of solvent in the 6½-gal. capacity steel tank. Agitation of solvent keeps interior of tank clean and free of caked sediment.

Jiffy Parts Cleaner, 8415 Fountain Ave, Los Angeles 46, Calif

Micro Snap Switches

Precision snap-action switches, designed for one-way actuation by cams, dogs, or slides, have spring-loaded, hinged-roller-arm actuators. One design has a 3/16-in.-dia roller and the other ⅜ in.

Either switch is available with solder-lug or screw terminals. Contact arrangement of both switches is single-pole, double-throw.

Micro Division, Minneapolis-Honeywell Regulator Co, Freeport, Ill

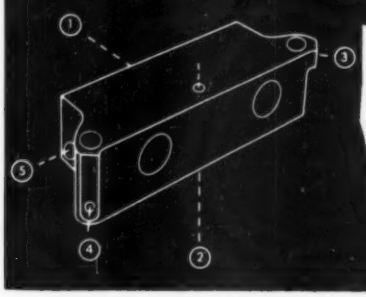
Corrosion-Resistant Valves Made of Polyethylene

Vanton corrosion-resistant plastic globe and Y valves are constructed of polyethylene—except sealing diaphragm which is a polyethylene-polyisobutylene mixture to insure maximum resilience and drop tightness. Valves will withstand corrosive action of most acids, including sulfuric, hydrochloric, nitric, and hydrofluoric, as well as many caustic solutions.

Reportedly light in weight but high in strength, valves are recommended for working pressures up to 50 psi and temperatures to 150 F. Sizes available now include ½, 1, 1½, and 2 in.

Vanton Pump Corp, Empire State Building, New York 1, NY

How would YOU drill or tap these holes?



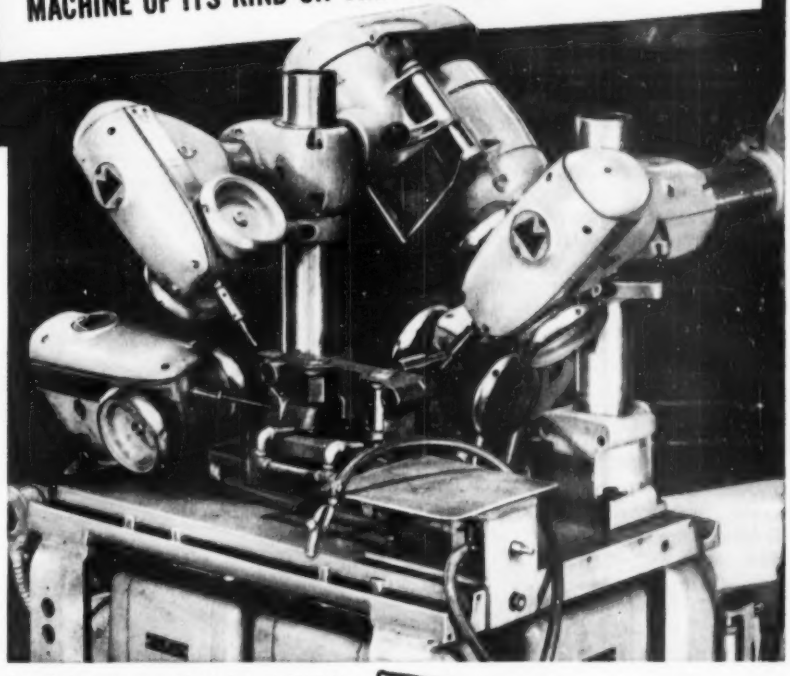
One at a time with a conventional drill?

Fine—but what if you have to *mass-produce* the piece? And what about labor costs? Accuracy?

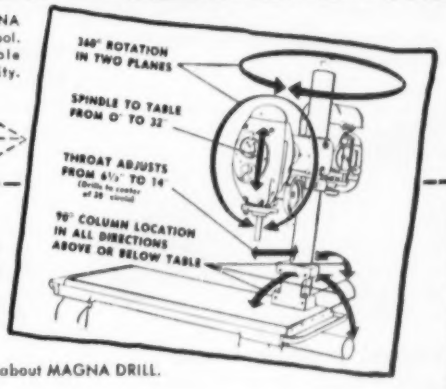
All at once with a custom-built multi-spindle machine?

O. K.—but can you afford to pay for such a machine? And what about costs on *short runs*?

OR ALL AT ONCE WITH MAGNA DRILL, THE LOW-COST UNIVERSAL DRILLING MACHINE, THE ONLY MACHINE OF ITS KIND ON THE MARKET?



As a single, gang, or multi-spindle unit, MAGNA DRILL is a rugged, *precision*, production tool. Enclosed drive adds to safety. Adjustable throat and angular freedom increase versatility.


360° ROTATION IN TWO PLANES
SPINDLE TO TABLE FROM 0" TO 32"
THROAT ADJUSTS FROM 6½" TO 14"
90° COLUMN LOCATION IN ALL DIRECTIONS ABOVE OR BELOW TABLE

Only MAGNA DRILL adapts so well to mass-production and limited-production drilling, tapping, reaming, counterboring. Any number of heads can be set up quickly to drill many holes at the same time, from *any* angle. Each can have its own speed, feed and drilling angle—for simultaneous or sequential operation.

MAGNA DRILL is fast and accurate. It cuts tool and labor costs in large and small shops, in both limited and mass production. In short, MAGNA DRILL gives you all the advantages of custom-built machines *and* conventional drills—without their disadvantages. You can change the set-up quickly, completely, at the end of the production run. First cost is low, operating costs are lower than you ever thought possible!

• • •

SEE MAGNA DRILL DEMONSTRATED! Fill out and mail the coupon. Free literature will be sent quickly; arrangements will be made for *you* to see MAGNA DRILL in operation.

MAGNA ENGINEERING CORPORATION

Dept. 250-L, at factory nearest you: 12819 Coit Rd., Cleveland 8, Ohio, or Menlo Park, California

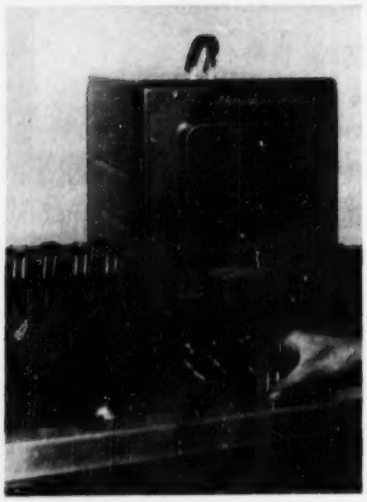
☐ Please send me more information about MAGNA DRILL.
☐ Have a representative call.

Name _____

Position _____

Company _____

Address _____



Dice Ultrasonic Metroscope Improved

Model MS-101 has been redesigned to improve signal-to-noise ratio, picture clarity, and line voltage correction. Unit is said to be particularly useful where wall-thickness measurements or tests must be made from one side of the material only. It also detects internal defects of a laminar type in sheet materials, and imperfect bonds between clad metals, switch contacts, bearing linings, and cutting-tool tips.

J W Dice Co, Englewood, NJ

Filters Redesigned

Titeflex filters have been redesigned to reduce floor space. Model IA-18-20, formerly occupying 16 sq ft of space, now takes up only 12 sq ft. Control valves are grouped in front of unit for easy accessibility; motor and pump are located in front of precoat tank and filter chamber for simpler maintenance.

Titeflex, Inc, 500 Frelinghuysen Ave, Newark 5, NJ

Overload Protector Insures Against Chain Drive Damage

Device has been designed to protect chain drives of all types from overload by tripping a limit switch in the event of excessive tension on the drive leg.

The Lamson Overload Protector consists of an eccentrically located idler sprocket counterbalanced by a weight-loaded arm. Counterbalance is adjustable so that unit will operate at any chain tension up to 1000 lb. Locking lever is arranged so that manual resetting is required to energize the drive once an overload has caused it to act.

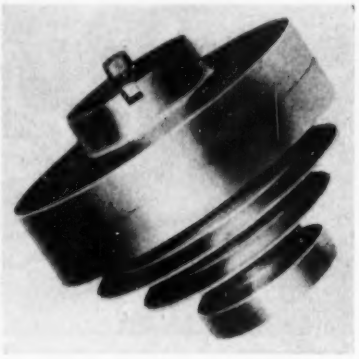
Unit, with an eccentric sprocket shaft of 0.875 in. in diameter, can be adapted to chain sizes from ½ to 1¼ in. Capacity of limit switch is 10 amp at 115 v ac, which can be increased to any specification by use of relays. The 20-lb device is 8¾ x 6¾ x 5⅛ in.; counterbalance arm extends 13 in.

Lamson Corp, Dept A1, Syracuse, NY

Heavier Bar Knobs

Malleable iron, cadmium-plated bar knobs for operations requiring greater work forces, locking pressures, and leverage have been added to the Morton line. Available in 2½-in. size with holes reamed and tapped ½, ⅝, or ¾ in.; also in 3½-in. size with holes ¾, ⅞, or 1 in.

Morton Machine Works, 2421 Wolcott, Detroit 20, Mich



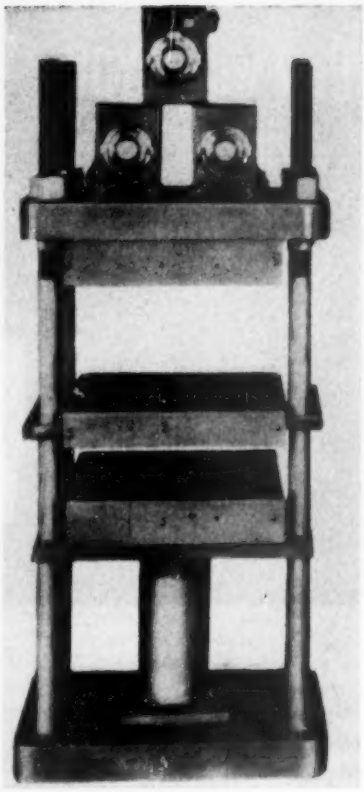
Speed Reducing Pulley Adaptable To Three Motor Shaft Sizes

Pull-Gear has introduced three new models of its speed-reducing pulley which permits drilling up to 1⅜ in. in steel on light drillpresses with a ½-hp motor.

Each unit is adaptable to three motor shaft sizes, ½, ⅝, and ¾ in., accomplished by means of two reducing sleeves, ¾ to ⅝ in., and ¾ to ½ in. Pulleys can be transferred to various machines with different motor shaft sizes; previous models were adaptable to one shaft size only.

New units are machined to finer tolerances and more ruggedly constructed for increased driving power.

Pull-Gear Co, 4118 E 8 Mile Rd, Detroit, Mich



Hydraulic Press Line Has Electrically Heated Platens

Four-post model, multiple-opening, hydraulic presses are available in 10-, 20-, and 30-ton pressure capacities to accommodate the following size platens: 10-ton capacity, 6x6-in. platen; 20-ton, 8x8-in.; 30-ton, 12x12-in. Platens are electrically heated and thermostatically controlled up to 450 F.

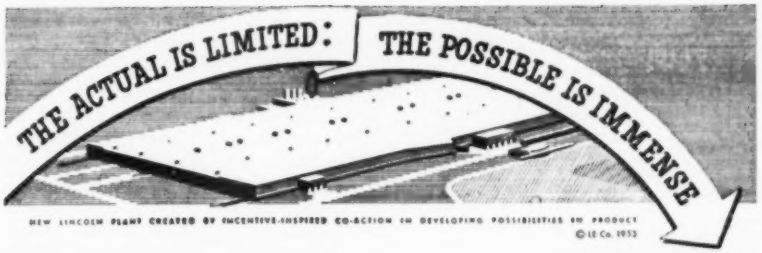
Units are adaptable for operation with a hand pump, or may be powered by the shop's existing central hydraulic system. Cylinders are built for 3000 psi operation. Presses are equipped with hydraulic packing, said to offer extremely little resistance on return stroke.

M & N Hydraulic Press Co, 780 Route 3, Allwood, Clifton, NJ

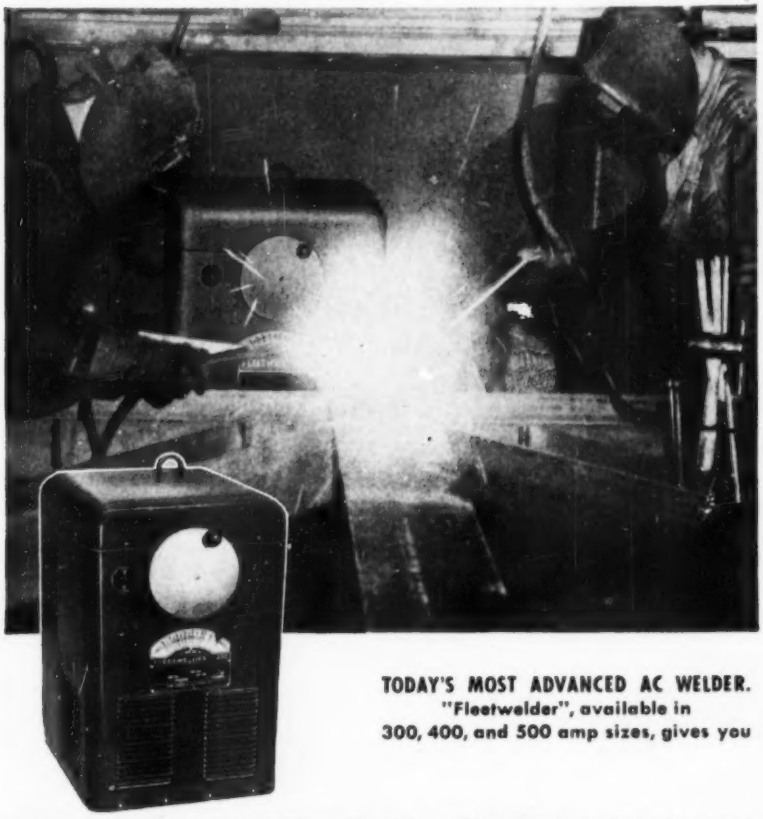
Pump Life Increased

Kenco Model 109 sump pump is equipped with a redesigned liquid level control switch operating on the principle of water rising to trap air in skirt of switch. New improvement is said to give up to four times the operating life. Pump, available with or without redesigned switch for manual or automatic operation, fits into a 12-in. cube; max capacity is 3300 gal. per hr at 10-ft head.

Kenco, Inc, 1125 North Ridge Rd, Lorain, Ohio



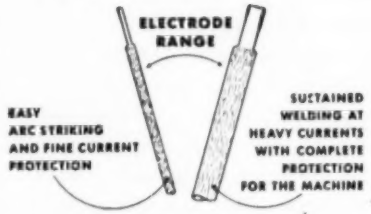
NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION ON DEVELOPING POSSIBILITIES ON PRODUCT
©LE Co. 1953



TODAY'S MOST ADVANCED AC WELDER. "Fleetwelder", available in 300, 400, and 500 amp sizes, gives you

EXTRA RANGE TO SAVE EXTRA DOLLARS on light and heavy work

LOOK at the sketch. It shows *how* you benefit through "Fleetwelder's" wide current range in which maximum welding currents are 15 times minimum current values.


ELECTRODE RANGE
EASY ARC STRIKING AND FINE CURRENT PROTECTION
SUSTAINED WELDING AT HEAVY CURRENTS WITH COMPLETE PROTECTION FOR THE MACHINE

This *extra range* teamed with "Fleetwelder's" exclusive "Arc-Booster" insures fine currents *with instant arc striking* for light gauge jobs while with the same welder you have ample amps for sustained welding at high currents.

No other AC welder offers this cost cutting combination . . . and at such low cost.

INVESTIGATE "FLEETWELDER" TODAY—See what new advancements in faster, more efficient welding are being put to use by Lincoln to simplify and speed your operations and cut your welding costs.

SEND FOR FREE BULLETIN 1314 *on "Fleetwelder". Available by writing on your letterhead to Dept. 2007.*

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO
THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

11 WAYS to cut AC welding costs

DESIGNED for faster, simpler, more efficient welding, Lincoln's "Fleetwelder" saves money on every AC job. Here's how:

1. SELLS FOR LESS—Built with Lincoln incentive production methods, "Fleetwelders" low selling price gives *more range, longer service, easier, faster operation, greater dependability* for the dollar . . . to cut your AC welding costs.

2. Complete Overload Protection—Built with *generous* reserve capacity for long sustained output at high currents, "Fleetwelder" is *completely protected* against damage due to overheating *by a thermostatic controlled magnetic starter* . . . a feature exclusive with Lincoln.

3. Exclusive "Arc-Booster"—Pioneered by Lincoln, the exclusive "Arc-Booster" blasts the end of the electrode with extra amps for an instant when the electrode touches the work to start the arc automatically. Ideal in out-of-position welding.

4. Completely Safe—No high frequency devices as on some welders to help arc starting. Open circuit voltage is only 71 volts. Output terminal panel recessed to eliminate accidental shorting of leads.

5. "Low Voltage" Safety Relays available for special work. (Optional extra.)

6. Takes Less Power—"Fleetwelder" draws less amps in idle current than required for other AC welders. Inbuilt power factor is higher. Has pilot light to indicate power is on.

7. Low Maintenance—Ventilated from the top, "Fleetwelder" operates cleaner . . . needs less attention. Coils are permanently anchored, cannot become loosened to wear the insulation and short out. Easy accessibility to all working parts.

8. Current Stays Set—Once set, current settings do not change . . . are "locked" in position by rugged drum type holding devices. Illuminated dial shows setting of welding current.

9. Steady Arc—"Fleetwelder's" reactor control is a free circuit designed for high responsiveness to changing arc conditions.

10. Compact, Portable—Only 35" high, 22" x 26" at base, "Fleetwelder" requires less space. Has connection for simple hookup to 220 or 440 volt line. Can be furnished with three wheel undercarriage for moving around the shop.

11. Instant Penetration—The extra current for arc striking also gives *complete penetration* at once . . . no more cold overlaps or partial penetration at the start of the weld.

the right "intake" for grinding "output"

SIMONDS ABRASIVE CO.

Grinding Wheels

To turn out top quality production, take in top quality wheels . . . Simonds Grinding Wheels. They're second to none in quality, economy, dependability . . . and in the variety and completeness of the line they comprise. It includes grinding wheels, mounted wheels and points, segments and abrasive grain . . . everything you need for roughing, finishing, cutting off, sharpening, polishing. No matter what *your* jobs call for, call on your Simonds distributor for prompt service that gives you superior grinding wheel performance.

Write for free data book and name of your Simonds Distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y. Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

Furane resin cement, called Resiment, has been developed for use as a mortar for acid brick or tile in corrosion-resistant tank linings, and similar installations. Product, said to be resistant to alkalies, acids, solvents, hot water and steam, impact, and abrasion, will withstand temperatures up to 375°. Shipped in form of powder and liquid for mixing at time of use, it sets quickly in any weather.

Delrac Corp, Watertown, NY

Flexoid Silentbloc couplings have rubber bushings operating with conical or twisting rather than radial deflection, permitting much greater parallel and angular misalignment with minimum shaft pressure on support bearings. Coupling, constructed without nuts or bolts, can be readily taken apart so that motor may be lifted out vertically. Lubrication is unnecessary; noise and mechanical lost motion producing shock and impact on keyways and driven parts are said to be eliminated.

Smith Power Transimission Co, 1545 E 23rd St, Cleveland 14, Ohio

Porous stainless steel filter sheet, designated Grade X, is available in finished line filters. Tensile strength is approximately 25,000 psi; smooth porous surface is undistinguishable from solid sheet, except by microscope; thickness tolerances are maintained to ±0.002 in. Sheet is available from stock in 0.040-in. thickness, with mean pore opening of 10 microns. Other thicknesses ranging from 0.020 up to ⅛ in. are either available or can be supplied.

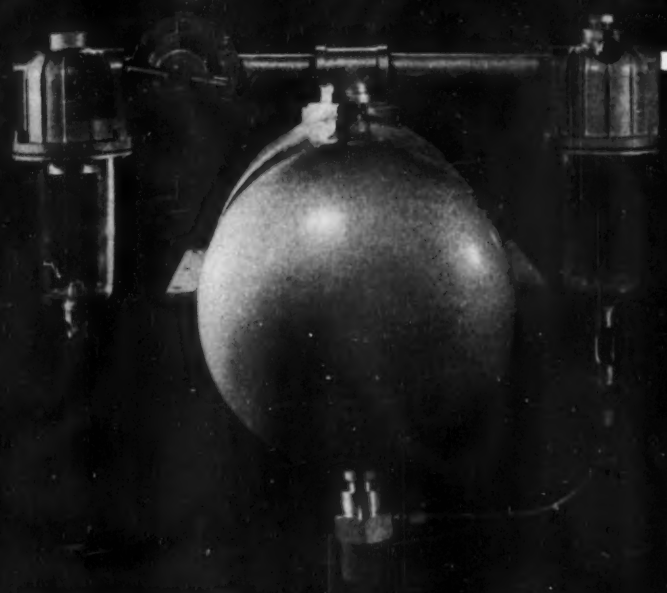
Micro Metallic Corp, 35 Sea Cliff Ave, Glen Cove, NY

Linear proportional solenoid, developed for jet aircraft fuel control systems, is available for other commercial and military uses. Device, in aircraft application, operates in direct linear proportion to amplified energy produced by a thermocouple. Mechanism, however, is applicable to other systems requiring proportional transfer of electrical energy to linear mechanical movement.

Connecticut Telephone & Electric Corp, Meriden, Conn

Vantrol 5481 series of drawing lubricants designed for light press work includes a pigmented, extreme pressure, paste compound, said to give superior finish, eliminate scratches and metal pick-up. An additional non-pigmented, extreme pressure product has been designed for lighter draws or operations not involving

IT'S NEW... lo-jet acro*



the revolutionary new coolant system that . . .

keeps cutting tool and work at room temperatures!

lo-jet acro's *proven results in America's leading industries are making production history, from coast to coast!*

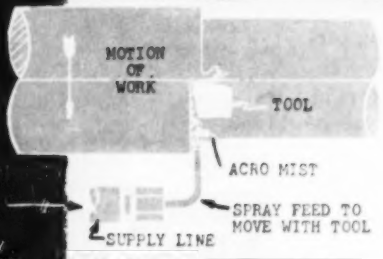
* Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

Pictured here is the 8'/8" outlet centrifugal equalizer distributor with 8 copper tube spray feed. This assembly serves 8 cutting operations.

lo-jet acro

- prolongs tool life
- cuts tool breakage loss
- saves money
- speeds production
- keeps work clean

there is a **lo-jet acro** *system for every purpose and every machine.*



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Our engineering staff will cooperate free of charge

lo-jet acro *is a product of*

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Gentlemen: Please send me full information about **lo-jet acro's** coolant system.

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xtra *ependable*

OFFICIAL U. S. NAVY PHOTO TAKEN OFF OAHU, HAWAII

UP FROM THE SEA comes fabulous Motor Stamina for Industry!

Over half a century of service aboard U.S. Navy submarines — *where dependability means life itself* — has bred tremendous stamina into ELECTRO DYNAMIC industrial motors. This inheritance of *extra dependability*, proved during years of gruelling duty under the sea, explains the amazing performance records being established by E.D. motors in industry today.

From 1 to 250 h.p.
(N. E. M. A. STANDARDS)

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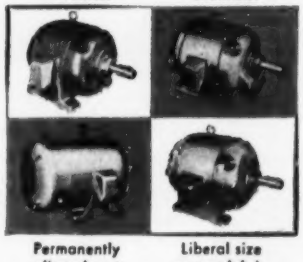
One-piece cast iron frames.
Extra large "free-flo" air channels.
Permanently aligned cast iron brackets.
Liberal size grease lubricated bearings.

Also a complete line of Direct Current motors and generators

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BAYONNE, NEW JERSEY

metal pick-up. Series, originally developed for drawing or forming stainless and high-alloy steels, works well with carbon steels.

Van Straaten Chemical Co, 546 W Washington St, Chicago 6, Ill.

Versabar structural steel framing is available in channel form in four basic sizes; variety of combinations can be furnished to suit specific requirements. Only tools required for assembly are a wrench and hacksaw; no welding or drilling is required. Assembled racks can be easily taken apart and are completely reusable. Wide range of standard and special fittings, brackets, and nuts is available.

M-H Standard Co, Versabar Div, 515 Communipaw Ave, Jersey City 4, NJ

Line of hermetically sealed small precision snap switches has been developed to withstand changes in pressure and temperature, exposure to high rates of acceleration, and corrosive elements. Work required to operate switch is approximately half the amount required for standard aircraft quality units. Resistive ratings from 0 to 50,000 ft include 28 v dc, 10 amp; 110 v ac, 10 amp, from 60 to 400 c, and a minimum life of 100,000 operations at rated load.

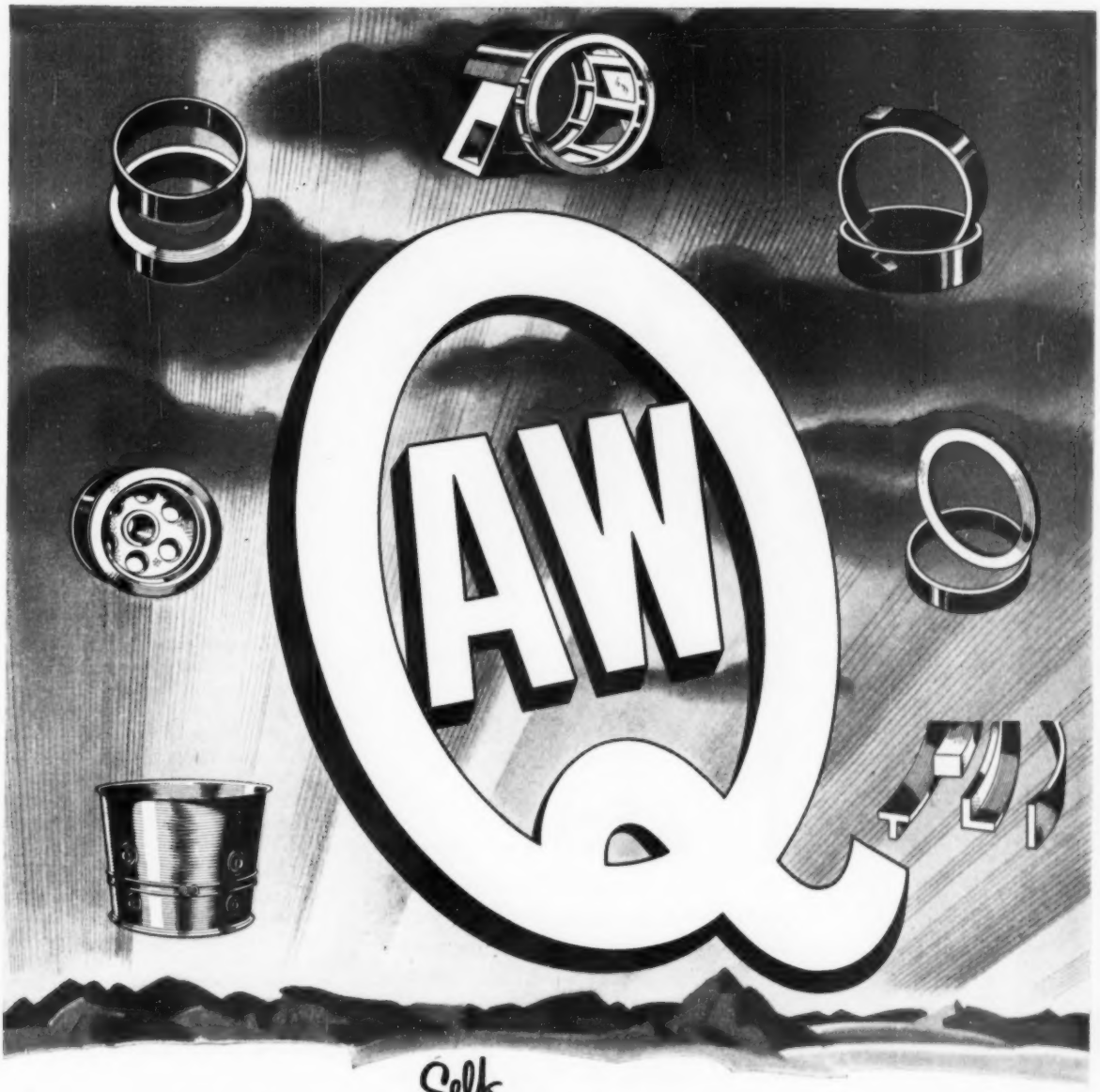
Haydon Switch Co, 232 N Elm St, Waterbury, Conn

Clear plastic tubing, Airflex No. 6904, approved under USAF specification MIL-I-7444A, provides high flexibility at extremely low temperatures, coupled with fungus resistance. Tubing can be widely applied as both primary and secondary insulation. Can be used as wire harness sheathing where low temperature flexing is a problem; as wiring conduit where abrasion resistance is necessary; and as a fluid drain or transfer medium.

Irvington Varnish & Insulator Co, Fibron Div, Irvington, NJ

Small, multi-purpose Taco pumps can be used as coolant units for soluble oil, and in applications where it is desired to move water at any temperature up to 210 F. Available in a wide variety of specifications, usually equipped with a bronze body and impeller, stainless shaft, and motors ranging from 1/100 to 1/12 hp. Designed for any operation requiring deliveries up to 22 gal. per minute, up to 21 ft of head.

Taco Heaters, Inc, 137 South St, Providence, RI



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Quality control is a term that can mean everything or nothing. At AMERICAN WELDING it is referred to as *quality self control.*

Every man and woman at AMERICAN WELDING feels an individual responsibility to make his work conform to the standards represented in the A.W.Q. symbol.

It's the *personal* symbol of the 800 experts that are joined in a common pledge to give you the best in welding.

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A company you'll like to deal with

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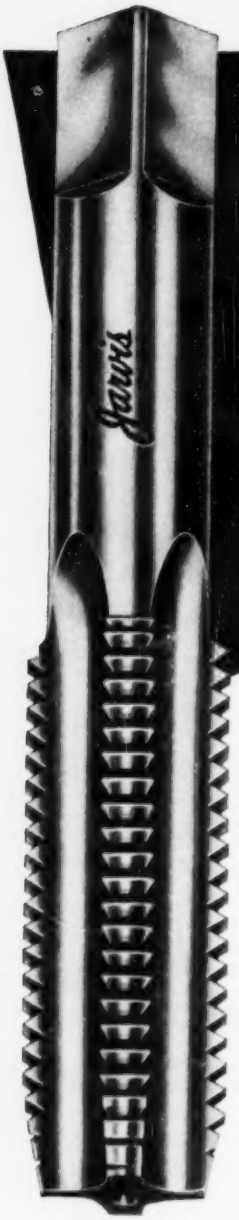

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have "Custom Made" Cutting Edges at NO EXTRA CHARGE

"Custom Made" means just that! Accurate indexing and precision machine grinding of flute and spiral points on Jarvis Taps produce a tool in which ALL the cutting edges do their share of the work. Our highly accurate fluting process makes it possible for us to control for your PARTICULAR NEEDS the amount of hook ground in the flutes. Specify Jarvis, and you'll always have "Custom Made" Taps designed to do a specific job superbly well.

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TAPPING ATTACHMENTS
TAPS · FLEXIBLE SHAFTS AND MACHINES
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DRILLS · BORING BITS

Send for complete Tap Catalog now—also name of your nearest Jarvis representative.

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

Test plugs for use in shutting off tube ends temporarily to test installations will hold pressures up to 100 lb, and can be used on all liquid or gas tubing lines except those where material conveyed would deteriorate synthetic rubber portion of plug. Available in ¼-, ⅜-, ½-, ⅝-, and ¾-in. OD.

Imperial Brass Manufacturing Co, 1200 W Harrison St, Chicago 7, Ill

Everlube dry film lubricants, colored green for easy identification, not only lock to the part, but are said to have penetrative powers to diffuse into preparatory surface coatings; mating surfaces create a lap-in action for long-life lubrication. Material is unaffected by solvents and reportedly has excellent abrasion resistance; can be sprayed, dipped or brushed on. Sample can is priced at $2.00.

Everlube Co, 4435 B San Fernando Rd, Glendale, Calif

Steel number and letter sets are available packaged in plastic boxes for easy storage; square holes keep stamps in correct position for ready use. Sets range in size from 1/32 to 1 in., with plain gothic characters; number sets cover 1 to 0; letter sets, A to Z and &.

Parker Stamp Works, 650 Franklin Ave, Hartford, Conn

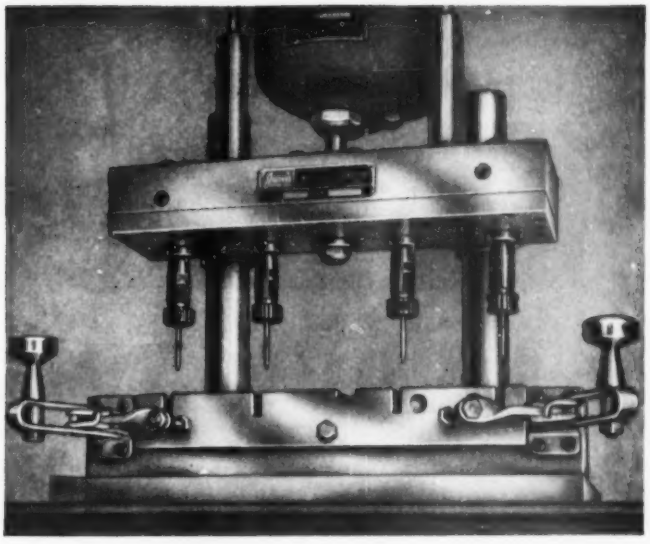
All-State No. 355 cast aluminum welding rod has been introduced for torch work in assembling, repairing, and reclaiming sand castings of aluminum. In addition to a plastic range of 1025 to 1150 F, it is said to color-match, have the same corrosion-resistance, and respond to heat treatment identically with standard type 355 aluminum alloys. Available in various rod diameters: 1/16, 3/32, ⅛, 3/16, ¼ in., and is 36 in. long. Standard packages, 5 lb.

All-State Welding Alloys Co, 249-55 Ferris Ave, White Plains, NY

Actane 33, a powdered product, has been developed to replace hydrofluoric acid. Product can be used in combination with sulphuric acid to remove silica, sand, and scale from steel; with nitric acid and ferric sulfate for pickling of stainless; with sulphuric acid for etching of aluminum; with nitric acid to produce mixtures that remove silicon and copper from aluminum. Contains soluble fluorides and penetrating and dispersing agents.

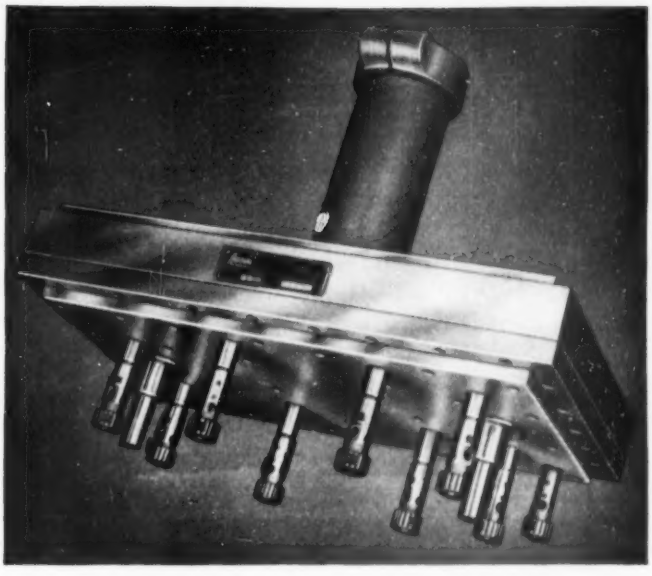
Enthone, Inc, 442 Elm St, New Haven, Conn

For Multiple Tapping and Drilling . . .



AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

Jarvis MULTI-TAPPERS



Engineered and built to your specific production requirements from our basic standard components, Jarvis Multi-Tappers can be furnished for any type of drill press available.

We invite your inquiries—let us assist in analyzing your tapping and drilling needs!

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NEW FEATURES OF JARVIS MULTI-TAPPERS

include:

- Aluminum case—Jig bored.
- Gear driven—positive action, silent drive.
- Ball bearings throughout.

WHEN POWERED WITH A JARVIS TORQOMATIC DRIVE THE JARVIS MULTI-TAPPER PROVIDES THE MOST EFFICIENT AND PRODUCTIVE MACHINE IN THE FIELD.

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Famco now offers the best engineered, most ruggedly built Band Saws in the market. Provide unobstructed view of cutting operations, and easy access to materials. Offered in four rugged wet or dry cutting models, engineered for continuous high production. Capacity 6" round . . . 6" x 12" rectangular stock. Four cutting speeds, 50, 100, 175 and 300 FPM. Safe, convenient controls and accurate microset stock stop. Simplified design permits quick, easy blade changing. Twenty-three long-life construction features described in free catalog. See your Famco Dealer or write today.

FAMCO MACHINE COMPANY

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AIR PRESSES • ARBOR PRESSES • BAND SAWS • DRILL PRESSES

Coruloy "T" chips, said to be extremely fine grained, tougher, and longer-wearing than aluminum oxide chips, have been introduced for fast-cutting operations of both ferrous and non-ferrous metal parts. Particularly recommended for use in removing large quantity of metal during a short processing cycle and when deburring is primary reason for processing. Available in all regularly listed Roto-Finish chip sizes.

Roto-Finish Co, Kalamazoo, Mich

Vantrol 5491A and Vantrol 554-H, water emulsifiable products designed for high-speed machining, are said to have characteristics which give superior wetting and high penetration, making them outstanding heat exchange elements; good lubrication, reducing frictional heat; lubrication of moving parts of machinery for high-speed operation, preventing binding, and eliminating maintenance problems.

Van Straaten Chemical Co, 546 W Washington Blvd, Chicago, Ill

Master templets of units such as switch assemblies and valves which remain constant from job to job can be cut with the Engravograph. Unit reproduces the original design by means of a rotating engraving cutter guided by a pantograph, duplicating the original on a sheet of transparent plastic. Manufacturer will furnish the templets from drawings or sketches submitted by firms not wishing to cut their own masters.

New Hermes Engraving Machine Corp, 13-19 University Pl, New York 3, NY

Electronic liquid level control, utilizing an all-cold cathode tube design, requires no floats, bellows, moving parts inside a tank. Accuracy is completely independent of pressure and temperature. Control utilizes the Haledy TT-1 triode tube, with an amplification factor of 2½ million.

Haledy Electronics Co, 57 William St, New York 5, NY

Permadizing is a rubber-to-metal bonding process with dimensional tolerances held as closely as metal—as fine as a 5 micro-finish. Process eliminates flash and flaring of rubber and bonding agent on metal inserts; successfully bonds aluminum to many varying compounds of rubber, synthetic rubber or silicone. Treated parts, for operation in a wide range of temperatures, can be made corrosion resistant.

Stillman Rubber Co, 5811 Marilyn Ave, Culver City, Calif

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THREE FACTS stand out...

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They are built to achieve lowest installed cost
2.
They are built to serve economically and dependably on the job for which you buy them
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They are built to do credit to your product and your reputation
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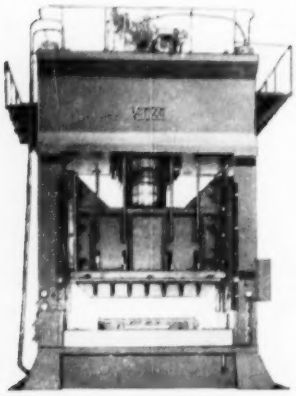
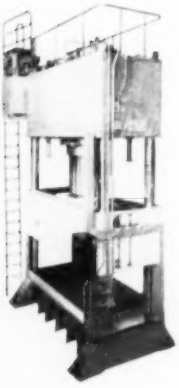
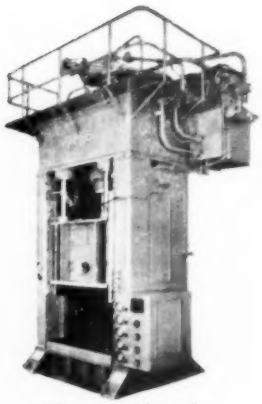
A COMPLETE RANGE OF HYDRAULIC PRESSES



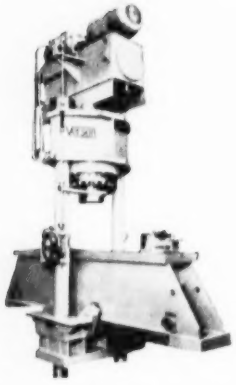
1200 ton straight side



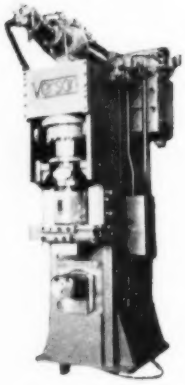
750 ton post type



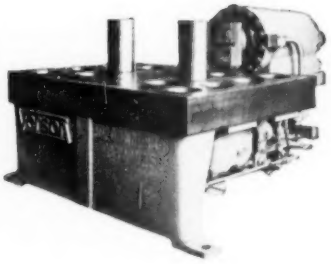
400 ton double action



400 ton straightening press



300 ton horn press



200 ton bending press

Write for your copy of the new Verson Hydraulic Press Catalog which contains detailed data on the entire Verson hydraulic line.

In the Verson line of hydraulic presses, there is a size and type to meet virtually every need from 75 tons up. In addition to the more common types illustrated above, Verson also manufactures such special models as gap type presses, bulldozers, hobbing presses, rubber pad cutting presses and pipe forming presses. If there is a question as to whether a mechanical type or a hydraulic type is best for your job, Verson, as a leading manufacturer of both types, is able to make unbiased recommendations.

Whatever your press problem, bring it to Verson and take advantage of our extensive know-how and experience.

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Process, termed Alcoa or Martin hardcoat, has been developed for making the surface of aluminum file-hard and more resistant to wear than chromium plating or hardened steel. Can be used in conjunction with electrofilm process which is a permanent solid film dry lubricant impregnated into the surface.

Pyrene Manufacturing Co, Metal Finishing Div, 560 Belmont Ave, Newark 8, NJ

GAMATEK radiation detector, a self-contained pocket-size unit requiring neither batteries nor external charging devices, accurately indicates on a direct-reading scale the total dosage of Gamma and X-rays to which an area has been subjected. By observing the time needle takes to move across the scale, and referring to a table printed on the back, the instrument can be used as a radiation rate-meter.

Consolidated Engineering Corp, 300 N Sierra Madre Villa, Pasadena 15, Calif

Cabinet, especially designed for storage of industrial vacuum cleaning hose and tools, is 18 in. deep, 40 in. wide, and 78 in. high, made of 18-gage welded steel. Unit has a 12x15-in. shelf for replacement items, wall brackets for 100 ft of hose and 33 miscellaneous tools, plus additional hooks and brackets placed inside the doors.

US Hoffman Machinery Corp, Air Appliance Div, 105 Fourth Ave, New York, NY

Black granite straight edges are available in lengths up to 48 in. for checking flat surfaces with accuracies up to 0.00005 in. Micro-flat material is temperature-inert, rust-resistant. Ends are tapered and fitted with leather grips for secure handling. Supplied in a special storage case.

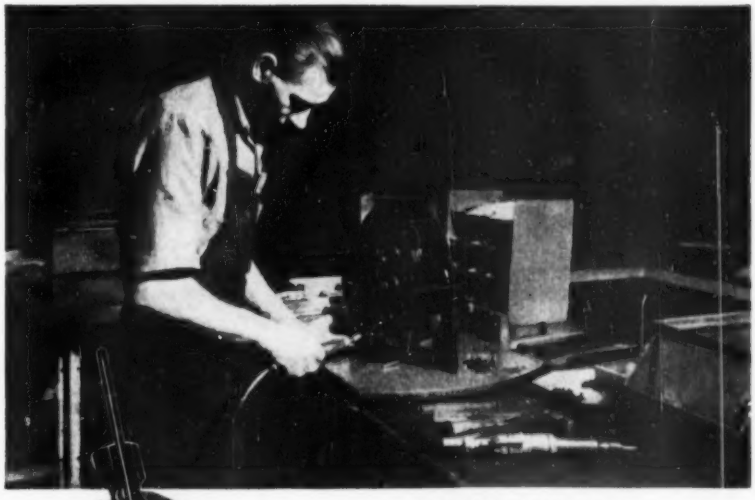
Collins Microflat Co, 2326 E 8th St, Los Angeles 21, Calif

Silicone-coated glasscloth has been designed for a wide range of applications where extreme temperatures of —70 to +400 F must be met, such as packings, gaskets, and diaphragms. Flexible material designated Compound HR-166-171, said to be heat and oil resistant, has been developed for fabrication of gaskets, seals, and parts for use in extremely high temperature applications.

Acadia Synthetic Products Div, Western Felt Works, 4115 Ogden Ave, Chicago, Ill

KELLER Air Tools

Increase Production per Man-Hour



ANOTHER EXAMPLE OF

KELLER *Air Tools engineered to industry*

Keller Screw Drivers and Nut Setters brought important benefits to a manufacturer of duplicating machines. He says: "Since we started using Keller air tools there has been a noticeable reduction in worker fatigue, and increased production per man-hour.

"Our work requires highly skilled, intelligent workers, and these tools have given them better satisfaction in their jobs, and improved our labor relations."

Weigh less

Consume less air

Reduce operator fatigue

Wide variety of handles, gearings, torques, speeds

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ABOUT KELLER PNEUMATIC SCREW DRIVERS

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Need fewer "back-up" parts in the tool room

Clutches, socket drivers, 45° and 90° attachments for every purpose

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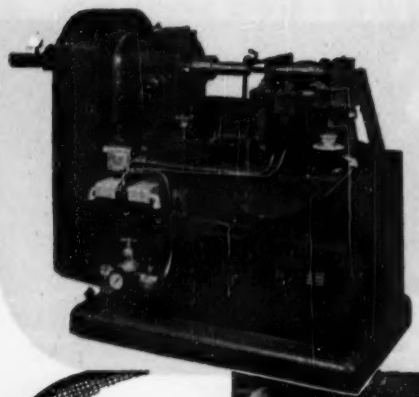
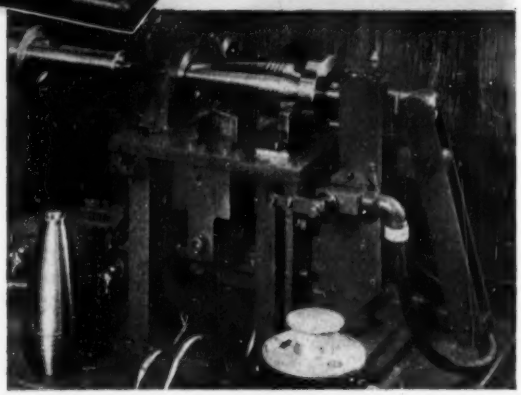
450 pcs. per hour!



Taps .800-16 in 81M Smoke Shell—7/8" STROKE

Another Cleveland Design to Speed Production!

MODEL E-2 HORIZONTAL



Day after day this Cleveland machine has been turning out an average of 450 pieces per hour! Two cradles operate on a 2 position, air-operated shuttle. Operator loads shell in open cradle and pushes palm start switch. At end of tap cycle in progress the new part is brought into tapping position and the tapped part brought out to one side for unloading.

Cleveland engineers have designed machines to meet the special requirements of scores of plants throughout the country. Because of their know-how—because of the precision tapping achieved at high speeds by Cleveland's famous lead screw feed and because several operations can be combined in one machine—you can be sure of getting more perfect pieces per hour with a Cleveland machine designed for *you*.

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A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

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CLEVELAND lead tapping machines screw

Model 80 split-joint spectacle with double bridge design for added strength is said to fit 90% of all faces. Plastic Retrax temples can be shortened or lengthened for exact fit. Lens replacement is accomplished by split-joint. Frames, available in two sizes to hold lenses 45x48 and 42x44 mm, can be furnished with or without clear or green safety glass.

Watchemoket Optical Co, 232 W Exchange St, Providence 3, RI

Kote-Rax Grade L plastisol coating has been developed for insulating and protecting racks, fixtures, and anode hooks used in electroplating baths. Light orange-colored product, easily checked for aging defects, is said to be resistant to all commonly-used cleaning, pickling, and plating solutions. After application of primer, fixtures are heated, dipped into coating for 2 to 5-minute cooling, then oven-baked for 10 minutes.

Hanson-Van Winkle-Munning Co, Matawan, NJ

Illinite power blades for sawing or cutoff machines are available in a complete range of popular sizes to fit standard units. Furnished in two types in most sizes: DuWeld composite blade with high-speed steel cutting edge welded to shock resistant chrome-vanadium steel back, and a specially treated high-speed steel blade.

Illinois Tool Works, 2501 Keeler Ave, Chicago 39, Ill

Wide selection of specialty strip metals available in coil and fabricated form from American Silver Co includes: ASC precision rolled and ultra-thin gage metals in widths up to 8 in., in thicknesses down to 0.0005 in., held to tolerances as close as ±0.0001 in.; ASC 14-karat gold overlay clad to copper, brass, or bronze base; ASC braze-clad, a siliver brazing material designed to produce joints effective over 100% of the bonding area.

American Silver Co, 36-07 Prince St, Flushing 54, NY

Industrial Inspectroscope is a tube, insertable in a ½-in. opening, for examination of machinery, dies, or products with cavities. As many as 60 tiny precision lenses reflect the image back and forth to the eye; strong light illuminates the area. Control wheel on the handle curves the tube to fit around corners, so that almost all areas of a cavity can be seen.

Eder Instrument Co, 2293 Clybourne Ave, Chicago, Ill

Synthane thermosetting laminated plastic materials are available in a wide variety of grades of standard stock. Basic forms are flat sheets in thicknesses ranging from 0.005 to 8 in.; tubes from 1/16 in. ID up to 26 in. OD; and rods up to 4 in. dia. Complete facilities available for fabricating parts to customer's designs and specifications.

Synthane Corp, Oaks, Pa

Line of Repro-Templets of 10,000 standard machine tools and plant equipment for layout uses are printed on acetate film, and represent overall dimensions of piece of equipment. Dotted lines indicate floor contact base; each is 8 to 12 cents.

Repro-Templets, Inc, Oakmont, Pa

Rubber centering device for circle cutting with American Pullmax sheet and plate working machines has been designed for cutting disks from stainless and brass where no center point mark is permitted, or plating operations must follow. Rubber centers holding the metal are actuated by regular quick-locking centering tools, turning smoothly during cutting.

American Pullmax Co, 2455 N Sheffield Ave, Chicago 14, Ill

Bullet-proof aprons made of glass-coated cloth have been designed for protection against flying metal particles ejected from high-speed milling and cutting machines. Form-fitting protectors weigh less than 3 lb, are ⅛-in. thick.

B F McDonald Co, Los Angeles, Calif

One-ton capacity Model C2000 welding positioner has been added to Aronson Machine's line of Universal Balanced positioners. Latest unit provides finger-tip positioning of any size workpiece from 10 lb to one ton. Particularly recommended in welding where downhand positions result in much faster weld deposit and higher weld quality.

Aronson Machine Co, Arcade, NY

Silver plating solution, known as Nu-Silver No. 66, permits silver plating without electricity or expensive equipment. Liquid is easily applied with a soft cloth or brush, or by immersing. Results are said to be comparable to electroplating. Can be used on silver, copper, brass, bronze, many other metals and alloys.

Specialty Manufacturers & Distributors, 508 New York St, Aurora, Ill

Teeth for the Giant

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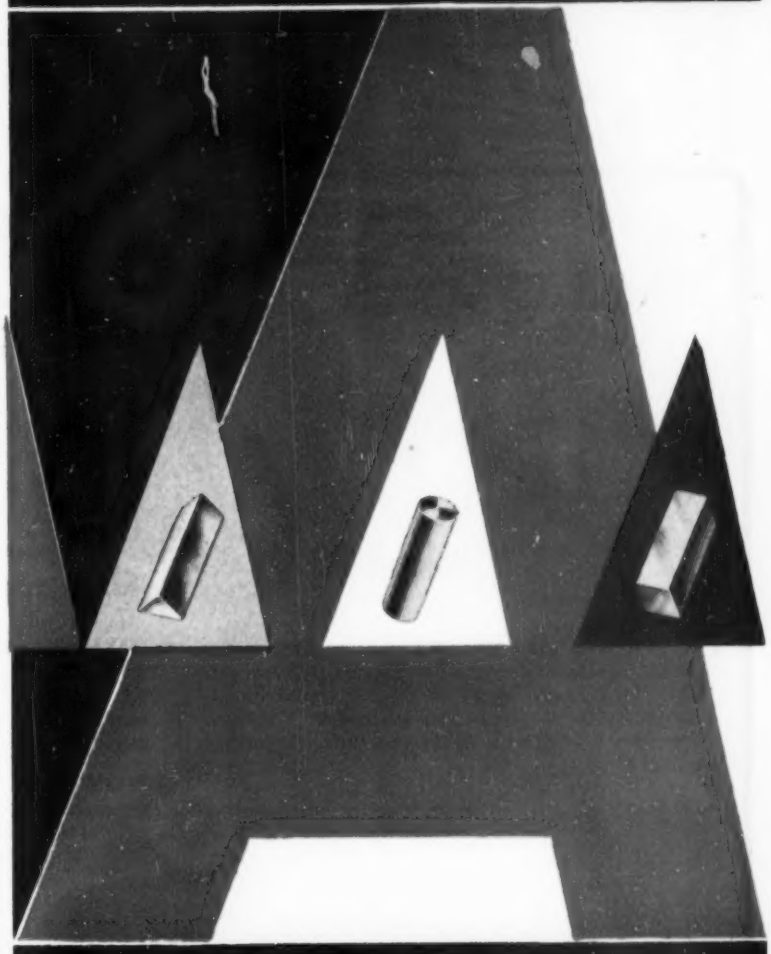

The tremendous power of America's metalworking giants is often focused at the simple tip of a cutting tool. ADAMAS tungsten carbide tool tips are the foundation for many of today's best production records. High-quality ADAMAS carbide grades are job-engineered to fit both standard and special tool tip, die and wear part applications. Delivery is fastest in the industry.

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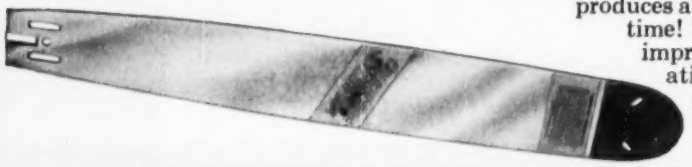
2 3M ALSO RECOMMENDED the right 3M Abrasive Belt on their Curtis Straight-O-Matic Grinder for final finish on saw bar surface. Previously, manufacturer had used a surface grinder for this operation.

3 NOW, this Portland, Oregon manufacturer produces a finer, more attractive finish in less time! Perhaps a 3M Representative can improve *your* company's finishing operations. His training and experience in industrial application of coated abrasives are available without cost or obligation.



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ROUND TABLE Discussion

COFFEE BROKE

Does the coffee break tend to increase or break down shop morale? Should the tendency of some workers to take advantage of the allotted time warrant elimination of the practice entirely?

CONGRATULATIONS ON your provocative editorial teaser under the heading "Coffee Broke" in your July 20 issue.

As the head of an organization that is continually wrestling with this problem on behalf of companies engaged in various kinds of metalworking activity, we have been compelled to develop ways and means of providing quick snack and coffee service during the 10 to 15-minute breaks in the middle of work periods.

We have found that the coffee break can be controlled just as completely as any other aspect of a business, if the management will just adopt a system which makes it possible for all the employees to get quick service within clearly defined time limits.

While we have met the problem in a number of different ways, depending upon the operating problems of the particular plant, the experience at one company is typical.

It has approximately 1200 employees, some of whom work in building across the street from the main plant where the cafeteria is located. The entire working force has been divided up into small groups who go to the cafeteria in shifts every ten minutes during the mid-portion of each work period. A bell rings in the individual department or subdepartment signalling the start of the rest period for each particular group and exactly ten minutes later a bell in the cafeteria signals the end of that group's coffee break.

Obviously, the physical arrangements for quick service are of strategic importance to the success of any such operation. We have found that the use of disposable, sanitary paper containers for service of hot and cold beverages is an effective aid toward the accomplishment of a really satisfying result in most situations.

Charles B Doron
Cleveland, Ohio

THE SO-CALLED COFFEE BREAK is one of those inimitable and inoperable creations of the New Deal benignly intended to aid the frustrated worker in getting out from under the

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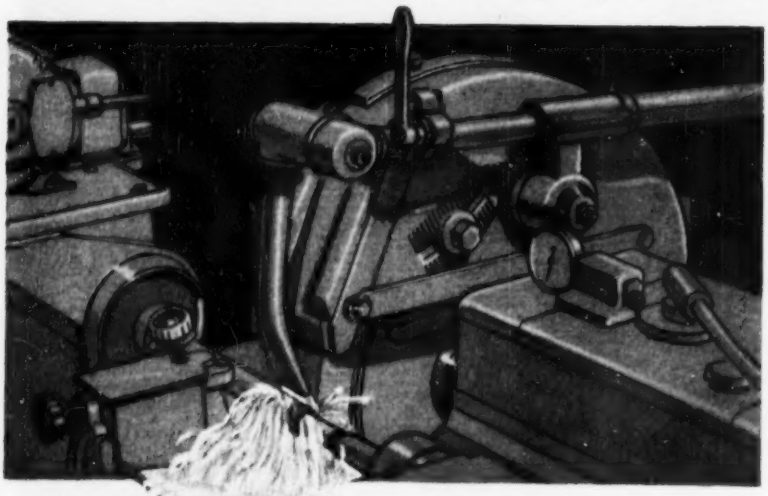

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yoke occasionally so that he will have time to think and remember to vote for the Great White Father who made it possible. Several choice remarks might be made about the coffee break. Dare we make them? We dare.

Speaking in the Websterian sense, I would define the coffee break as a legalized license to loaf. It may be classified in the same file with portal to portal pay, the five-minute grace period for ringing in in the morning, the fifteen-minute wash-up time at the end of a shift, and the rest of the long list of palliatives offered by union business agents as justification for their annual pass on the gravy train.

As this subject is a delicate matter, it is best for the auto trades and the shoe button machinery folks to speak for themselves. I speak only for government installations and I speak objectively.

Now if a man has attained the sublime rank of, say, a project engineer, it operates in this wise. At any time from 7:58 to 7:59 am, the mighty one drags himself into the dining room of the cafeteria and orders coffee, saying "I worked late on a report last night."

With these weighty words he slumps wearily into a chair at a table where his nine collegues have already convened. At 8 am, the dining room doors are closed to the riff-raff while the higher echelon cling more tightly to their chairs. Some member brushes off the service by stating, "This is a conference."

When the coffee is delivered to our hero at 8:05, he says, "Throw a couple eggs in the pan with the bacon and potatoes; I worked late last night."

Several brothers join in and say, "Make mine the same," or, "I'll just have coffee."

But work goes on steadily. Who's got the best color film, Eastco or Ansco? Occasionally some one offers a remark like, "Say, Fred, I hear you found a way to get the money for your train fare before you take a trip."

"Naw," Fred answers. "Nothin' to it. Uncle doesn't work that way. You might be killed on the trip—then they'd be stuck."

At 9:30 the session breaks up. The matter of just whose baby had the worst case of diarrhea hasn't been settled, but these intrepid boys have a motto, "The tanks gotta roll."

At 10:30 the same crowd reconvenes at the local coffee machine, but it isn't good. Those machines sport an unfeeling sign which says "Clasp a cup, and cop it."

But at noon the conference re-

groups at the lunch table. At 2:30 sharp it breaks up. Those boys realize that the coffee break is a privilege and they don't abuse it. At 3:30 the coffee machines provide the last break of the day.

Now in the labs it is different. If the lab chief happens to be an 8:30 lad, why clearly nothing can be done until he shows up. On his appearance, the pot is put on, and the chief and his secretary hobnob genially with the keeper of the Bunsen burner until 9:30 when the day's work begins. At 10:30 another pot is brewed, and the real coffee break starts. It generally lasts until.

The matter of afternoon coffee has never been settled. Some prefer 1:30 and 3:00 p.m. Others prefer 2:30 only. To avoid hurting feelings, it seems best to honor both times, and this is done.

Of course, things are different if the chief happens to be a non-coffee man and one of those rare individuals who eats his breakfast at home. In that case, the boys generally start a path to the coffee machine as soon as the bell rings at 8 am, while the girls break open their thermos bottles at the same time. After all, they are sitting at their own desks and nobody can find fault with that. So, with bright chit-chat tossed back and forth, time moves along until 9:30 when the serious work of the day begins. The standard break comes at 10:30, while in the afternoon it may come at anytime. All in all, it can be readily seen that there is no coffee-break problem at government installations.

Now whereas everything is harmony and peace in government installations regarding the coffee break, it is my considered opinion that men like Harvey Firestone and Henry Ford would be very unhappy about the whole thing. I believe they would wonder why people didn't eat their breakfast at home.

James K Matter
Detroit, Mich

"You don't see Fred making passes at the girls. He's too fine, too decent, too old."

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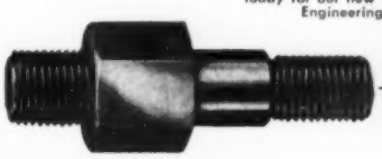

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REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

INDIAN GIVER

Should a foreman have the authority to arrange occasional special vacation schedules for the men under him, or is this the prerogative of the personnel department? Does the foreman or the front office know better as to when the work load will allow special treatment?

UNFORTUNATELY, the name "foreman" is as vague as the name "engineer." It ranges from big important jobs to little unimportant jobs.

In this case, the personnel department is not an aid to the foreman but, instead, makes the decisions on personnel matters. Ed should acclimate himself to the fact or exercise the prerogative of the Fourth Freedom. Specifically, however, the boss has made a mistake, because he should back up Ed's deal with a "Don't do it again" admonishment, so that Ed and the company can hold the respect of the men.

I guess by now Ed should realize he is a foreman with a little job, not a foreman with a big job, and not make any more deals.

Sheldon Meyers
Massapequa, LI, NY

IT IS UNFORTUNATE that companies do not establish policies and let their foremen know about them. The problem which faces Al and Ed would not have come up if only a little forethought had been given to the setting down in writing of the policy of the company on vacations.

Increased regimentation in our industrial business is not the basic problem. The problem is deeper seated; it is a matter of proper education and an understanding of company policies, plans, and functions of the various departments. No one can expect a foreman to outguess all the rest of management. Foremen must be taken into considera-

"Don't you think she was cute looking, Alvin? . . . . . Alvin?"

"YANKEE" VISES

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Off the swivel base, end down for accurate marking.

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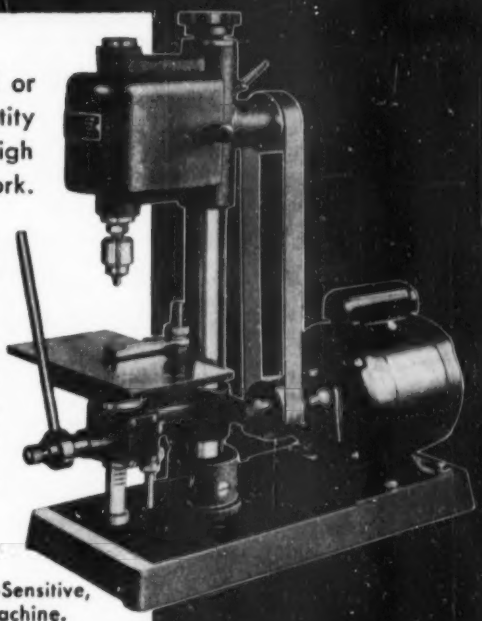
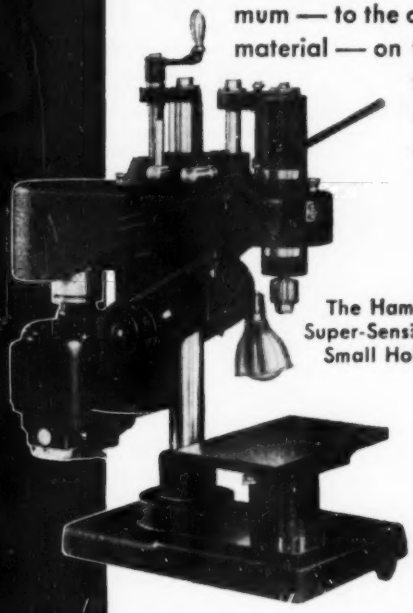


The HAMILTON® Super-Sensitive, Small Hole Tapping Machine.



The Hamilton VARIMATIC® Super-Sensitive, Variable Speed, Small Hole Drilling Machine.

Multiple spindles also . . .

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tion in the modern setup of business operations. They must be helped to understand how a company operates, why departments are established, and their purpose in the organization.

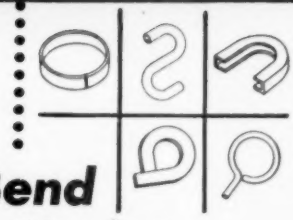
We must always remember that our foremen are the front line of our industrial world. They represent the company to the masses. Therefore, they must be trained to make the best possible impression on the workers. Conditions such as faced Ed cause resentments to build up both in the workers and in the supervisory team. The foremen lose face and must find some way to crawl out from under.

Human nature says to blame the big boss and the company. This is done with the result that the workers begin to wonder about company harmony. They talk among themselves first, but it spreads to the home. The wives begin to learn that Ed was blamed for being out of step with things while trying to help a worker out. In small towns where the companies themselves are relatively small, this is a very serious problem. Company policy discussions held by the townspeople can be very damaging and have repeatedly caused companies to lose good employees.

In the olden days of non-specialization, a foreman handled all the details. He ran the shop; he was the Bull of the Woods. Now we have advanced to high levels of supervision. We have eased the foreman's burden by giving him assistants and aids. We have tried to help him to do a better job by letting him call in a specialist. But we have failed to tell him about his use of these aids. We let him flounder along getting into trouble and blaming him for his mistakes.

A foreman has every right to be thoughtfully considered by management. He should not be allowed to merely wither on the vine. He needs

"I know Rome wasn't built in a day, Jones, but you're working for us now."



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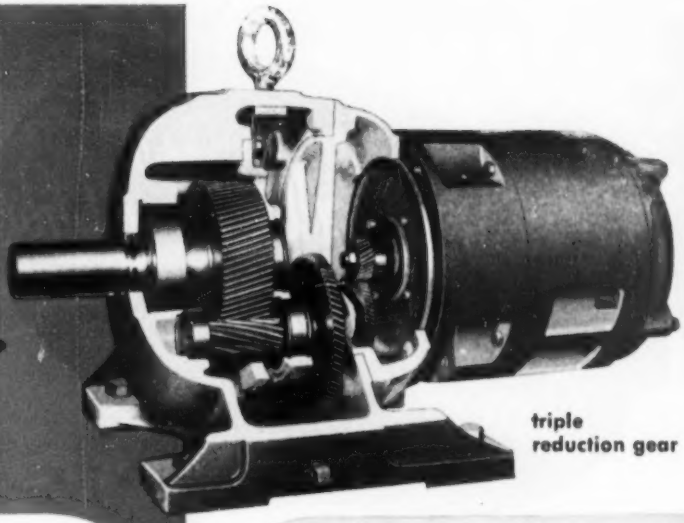

triple reduction gear

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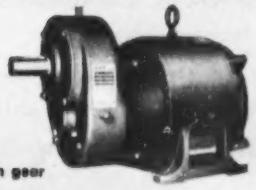
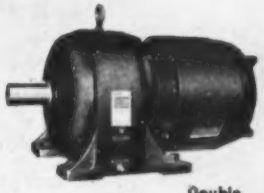
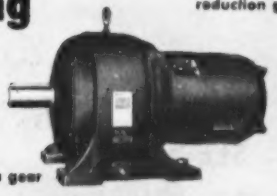


Single reduction gear



Double reduction gear



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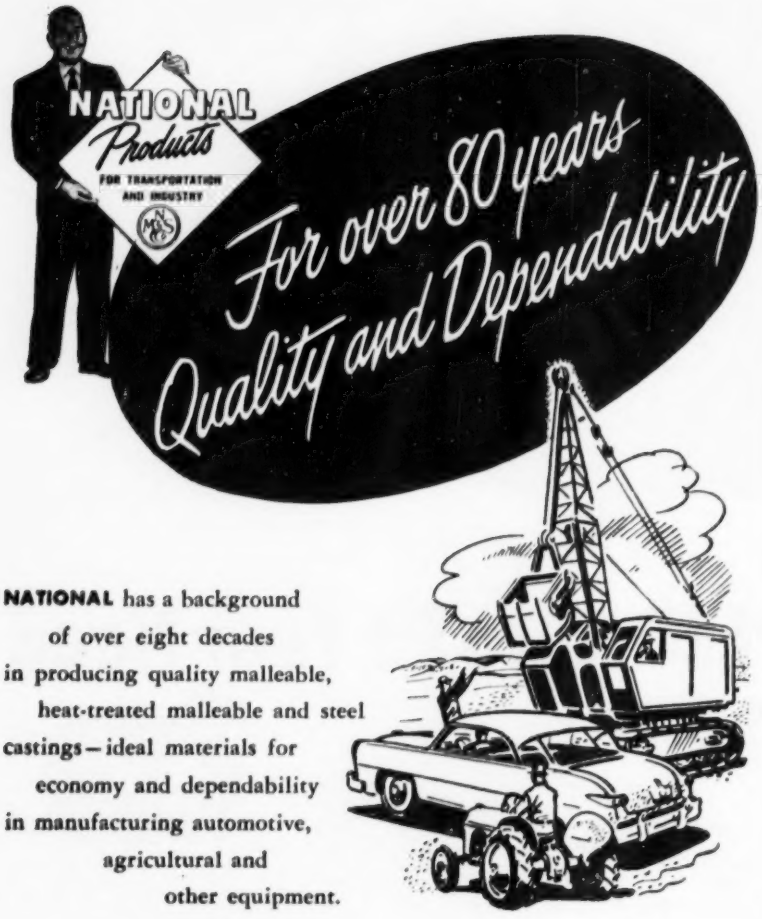

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help. He needs a written company policy to guide him, a book of instruction regarding the function of foremanship and its relations to other departments in the company.

People don't mind the regimentation if they feel that they have suggested it, or if they are part of it. They do resent being slapped in the face with facts they should have been taught but were not. We need more training for our lower supervision. Yet in order to do this we must find a way to teach them the need for such education. It can not be forced upon them; they must want it and demand it themselves. All problems can be easily solved if a company will develop written instructions, job analysis, and company policies or standard practices.

Charles D Townsend
West Hartford, Conn

SOME BOSSES used to put their foremen on the carpet occasionally irrespective of any reason. They thought terror was the best means of upholding discipline. Very rarely, however, did they appear as Indian Givers. Only on one occasion in several decades have I found one of them. He put aside a fund to be used for pension purposes, but when times grew bad he put that money into his business again.

If Ed has promised Tom Jones and Dick Hartley to let them off for a week to go hunting, he should do everything he could to keep his word. Should the boss prevent him from doing so he should tell his men who is the Indian Giver and let them know that so far as he is concerned, he'll stand by his word.

But why did Ed promise these two men a week off if he wasn't sure the boss would sanction his decision? Usually the boss would accept such promises given by his foremen. If Ed's authority didn't cover a promise of that kind, he should have turned the men's request over to the boss without committing himself.

Perhaps it was lack of rules that put Ed into the bad position he now occupies. If so, the boss must handle this proposition to the satisfaction of all concerned, otherwise both production and Ed's authority will suffer. If there were rules stating the personnel department should give written permission for any unusual vacation time, then Ed should tell his men that evidently he had made a mistake—this would not jeopardize his authority. If there were no rules to that effect, Ed's conscience is clear.

If the boss makes a liar out of his foreman in a case of this kind, he's

very likely to do the same thing in other connections. Then the question arises: Did he do it on purpose to make Ed mad and hope he would take it as a notice to leave? Or is the boss a poor organizer or a poor psychologist? All three propositions are possible.

Al's statement that the boss is relieving Ed of a lot of trouble when turning his thumbs down in this case is really not the issue. I cannot accept it except for the future, when no promise should be given, because where would it lead to give promises without keeping them? Promises must be kept under all conditions, otherwise all decent relations between employer, executives, and labor will be ruined.

Ed's idea to help work out special vacations and time off, as long as it doesn't interfere with the work, is very sound, but when doing so he should always tell his men such vacations must be authorized by the boss.

I agree with Ed that he as foreman can tell better than anyone in the office when he can afford to be slightly short-handed. I don't blame him for getting sick and tired of such interferences and red tape.

The boss should put down rules so that the foremen know what to do on different occasions, but then, he should leave it to them to be carried out.

It's very difficult, however, to suggest whether or not inrceased regimentation is a help or hinderance to a foreman; it depends so much upon what kind of a foreman is involved. If a foreman abuses his authority, his power must be restricted, but if he cooperates with the boss to carry out a policy of mutual interest he might be given freer hands.

A E Fristedt
Stockholm-Bromma, Sweden

"Did you order a lunch sent up?"

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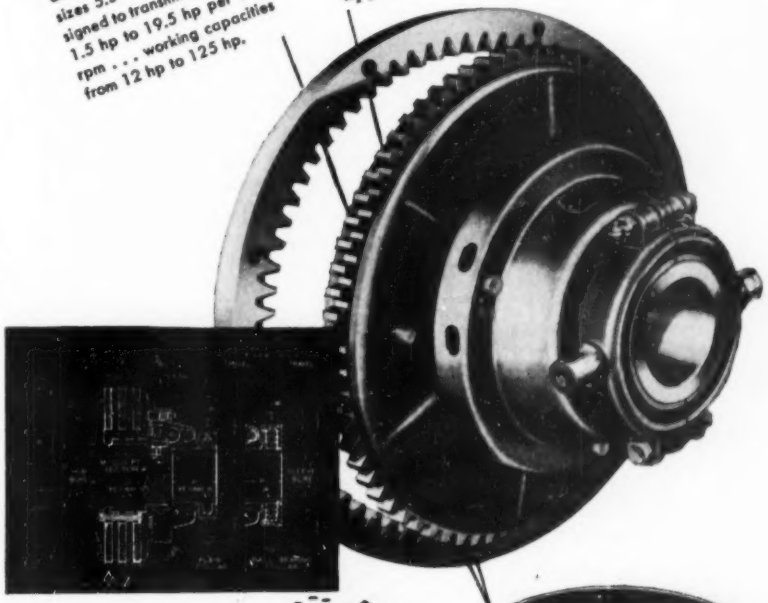

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AM-9-14-53

In modern industry too many limitations are placed upon the authority of a foreman. Years ago, the foreman hired a man, set his starting rate, gave him raises when he earned them, promoted or demoted him, arranged his vacation, disciplined him when and how it was necessary, and fired him if he was inefficient. In short, the foreman in many cases was completely responsible for all phases of the operation of his department.

As industry and its associated problems became more and more complex and requirements arose for a greater number of competent foremen, it became necessary to relieve him of some of these heavy burdens. So personnel and staff organizations were formed to take over some of this work and to advise him on the carrying out of other functions. This step was probably also made necessary by the large increase in the industrial work force of the nation which gave rise to a constantly increasing group of foremen. Undoubtedly, the quality of foremen also deteriorated during this period. In my opinion, we now have the most technically competent group of foremen we have ever had. They demonstrate daily the ability to control and to supervise the most intricate and difficult industrial processes ever developed.

This concentration on the technical phases by foremen has caused them to neglect the equally important personnel phases of their jobs. Now the realization of the magnitude of this loss is becoming apparent to all concerned. Certainly the least of the authorities a foreman must have the privilege of arranging vacation schedules.

The company is going to be without the services of Tom and Dick X number of days. They are going to have to pay him Y dollars for this vacation period. How someone sitsitting behind his polished mahogany

"Wonderfully built . . . probably works like a charm, but we've had some trouble with the starter button . . . can't find it.

desk in the personnel office can decide whether or not this special vacation will affect the operations of a department is beyond me.

Actually, in many cases, special consideration of vacation, working hours, or work assignments is the only remaining way in which special or outstanding services can be recognized. If Al doesn't make this an issue and win his point, he can cross off one more of his freedoms.

A man should have only one boss to whom he reports and who has complete authority over his actions. We are rapidly approaching the day in some organizations where a man received technical instructions and work assignments from his boss, but must report to the personnel office to find out anything else.

R E Moulton
Huntington Park, Calif

•

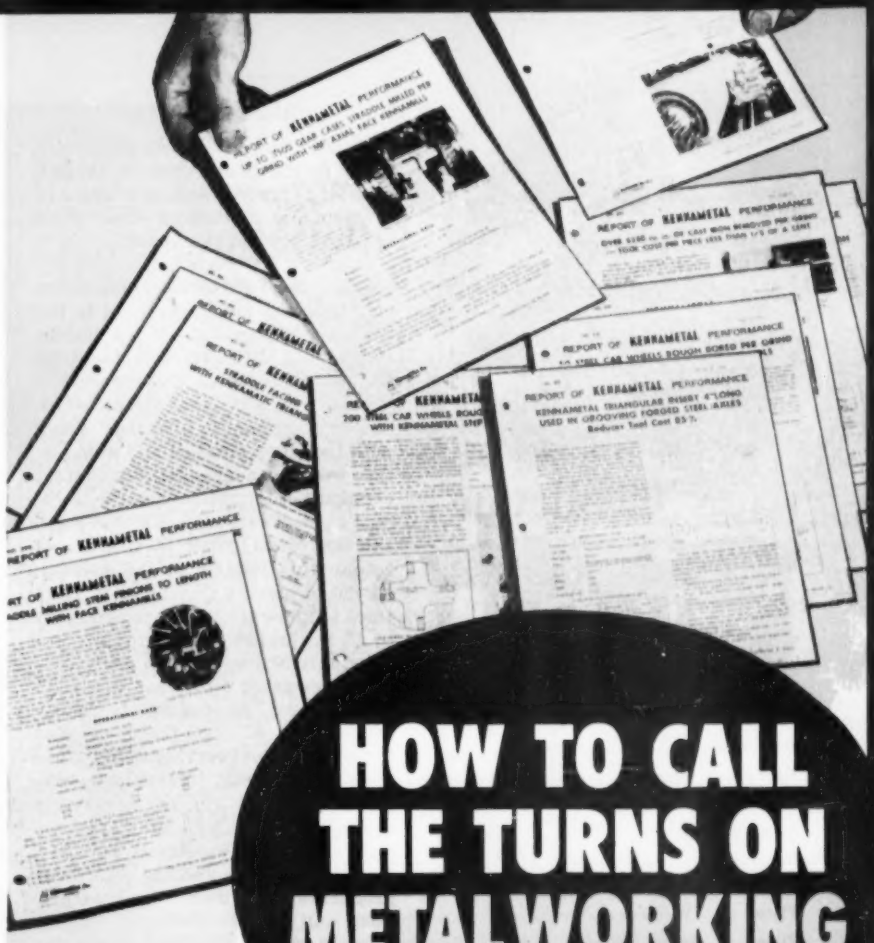
DOUBLE STANDARD

Will one set of prints, with fixed tolerances, solve the problem of variations in tolerances between engineering, shop, and inspection? Or will allowances continue to be made despite a single standard?

THE USE OF DIFFERENT tolerances on either drawings or gages does not seem to be in keeping with modern shop practice. Many of us remember when it was not uncommon to give the shop man gages that had been worn beyond use by inspection. It is hard to imagine a worse practice. The present tendency is to reverse this and so be sure that any work which is really within limits of the workman gage will pass inspection. Double standards on the blueprints might be even worse.

I ran into practice of this kind many years ago when trying to standardize the rods which actuated the valve gear of a fairly well-known steam engine. The practice had been to wait until the engine was assembled and then cut the rods the right length to fit. We tried to correct this but found that our work was nullified by the shop superintendent ignoring the specified length of the bed so that the rods were too short when they came to assemble the engine. It was cheaper to make new rods than to face the end of the bed to proper length, so the shop won out on that particular engine. We finally got the management to agree that the shop should follow dimensions on the bed length and our troubles were over.

Fred H Colvin
Point Pleasant, NJ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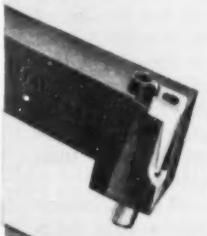
HOW TO CALL THE TURNS ON METALWORKING JOBS . . .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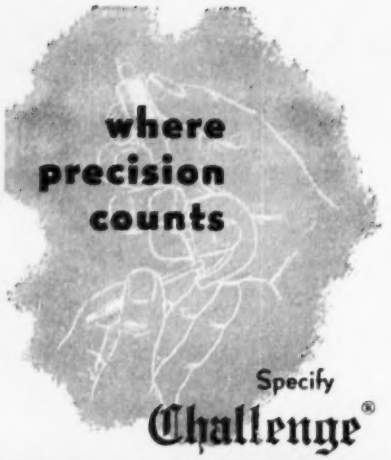

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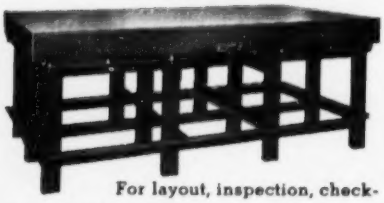

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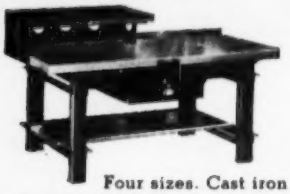

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CRAZY NUMBERS

Are detailed cost reports of specific value to the busy foreman, or will he tend to ignore them as a waste of his valuable production time? How can they be best presented?

COST REPORTS FOR FOREMEN may either be a welcome aid or nuisance to the foreman, depending on his intelligence and initiative, and the type and presentation of the reports.

I have heard foremen complain that management furnishes them with too many detailed and unnecessary reports which do not contain pertinent information for the foreman's use. These men say that management must think they are cost accountants, judging by the monthly spread of reports they receive. They want to know why management goes to all the trouble furnishing reports when foremen know their costs.

I believe that a foreman is indeed short-sighted in failing to make proper use of well-prepared and timely reports. Progressive management realizes that foremen are in a good position to reduce costs, both direct and indirect. In addition, foremen are vitally concerned with the planning of work and the control of production in their departments. They will manage better for having beeen furnished this data, especially if the reports are in the nature of statistical tabulations compiled from cost and production records. When foremen receive cost figures, they are likely to regard themselves as managers in the true sense of the word, and will manage better than if no data were furnished.

Most concerns do not give foremen direct costs, but many supply them with burden statements. There

"You have no idea of the dirt I shovel out after a production meeting!"

Drill jigs and other fixtures are simpler, cheaper, smaller when made for use in a SPEED VISE. Instead of a cumbersome and expensive box jig, with a SPEED VISE it is only necessary to make a simple jaw plate to fit the part being machined and hold drill bushings, etc.

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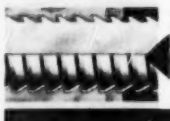

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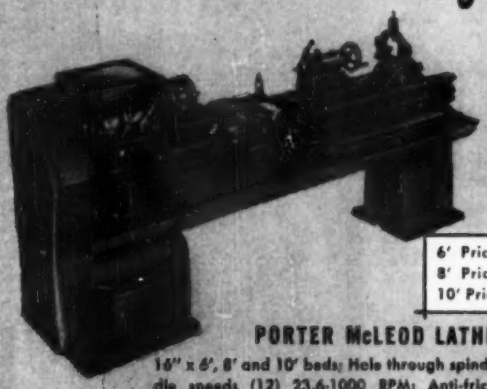

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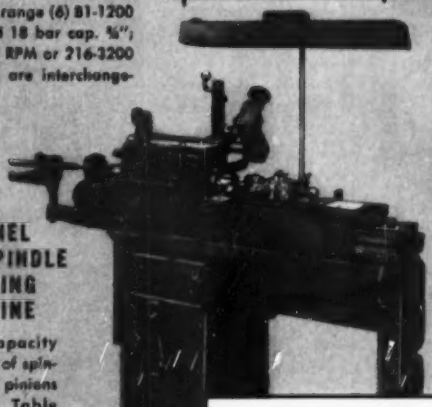

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seems, however, to be no adequate reason why foremen should not get direct costs, since they are in a position to reduce not only these, but also indirect costs. Where good standard costs exist, the foreman should watch the actual performance and compare them with standards, daily if possible, and if not so often, then weekly or monthly.

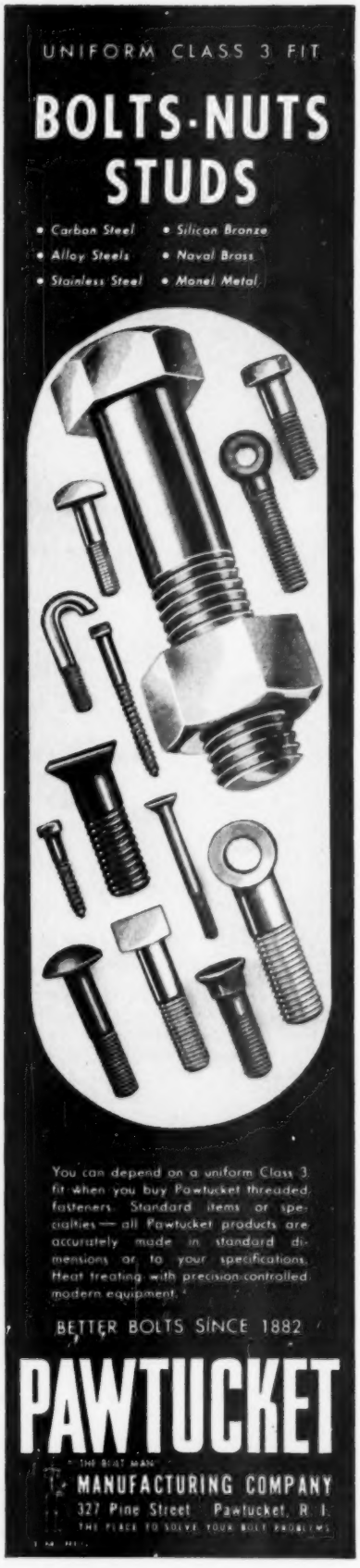
Each foreman should get a monthly copy of the burden statement for his department. This statement should list all indirect labor, maintenance, supplies, and proportioned charges such as depreciation, taxes, insurance, power, light, heat. Some cost accountants show the total burden which foremen can control as a separate figure from the apportioned expense, which some say are uncontrollable. Foremen should be told why and on what basis the apportioned expenses are charged to their department. Each foreman should get a statement showing him the comparison of his monthly burdens for six months. Many economies can be effected by a close study of monthly burden statements and comparative burden statements.

The foremen should be given the advantage of seeing the actual cost sheets on each completed order, so that they may note eractly how successful their department has been in producing the work assigned.

In any business doing a large amount of rapid work, the detailed cost of each run should be entered on a comparative cost sheet. This comparison will show, side by side, the unit time and cost for each operation, and for each period where this particular unit has been in use. Fluctuations in direct costs are the net result of different workers who may run the same machine or perform the same operation. A very careful study should be made of the resulting cost as shown on the comparative sheet. Many times this comparison will bring out possibilities of eliminating the more serious fluctuations, and perhaps reducing time and cost, through careful examination and revision of operating methods.

Not only should foremen get burden statements, but statistics showing the amount of the direct-labor payroll; the amount of indirect-labor payroll should likewise be placed in their hands. Comparative labor costs can help foremen and management ascertain whether they are out of line with past and expected performances.

Foremen should also get direct-material costs. While they cannot control material prices, they do have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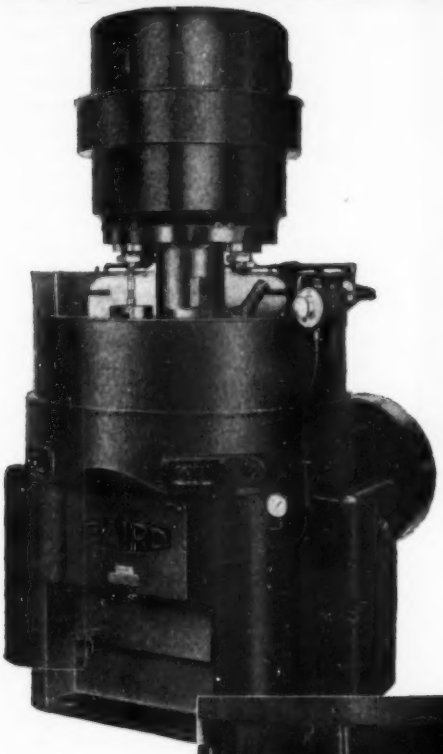
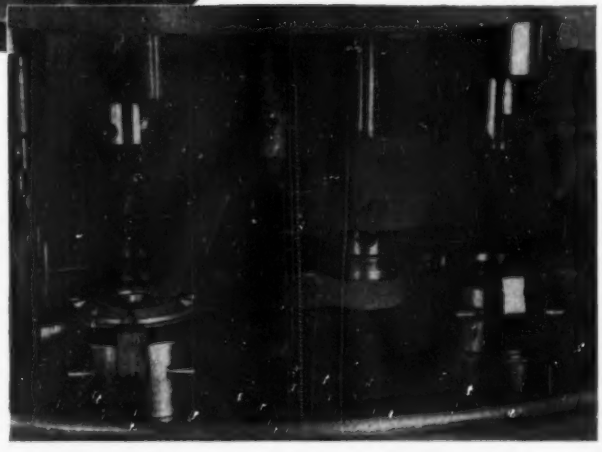


(Above) Front view, showing splash guards for wet cutting.



(Right) Tooling set-up for finishing a generator end plate.

TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.

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5. Unusually versatile.
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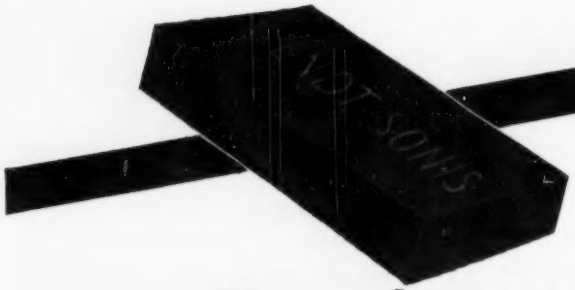

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a large part in controlling the use of materials. Excessive uses of material are detected by comparing consumption with material specifications or bills of material which show standards.

Among the most frequent reasons for diverging from the standard cost of material are inability to receive the standard material, increase in cost, large spoilage, and waste on account of using wrong size. It often occurs in making some product that too expensive material of a given size is used. This may be the fault of the operating department which has chosen the wrong material, or it may be the fault of general business conditions, which make it impossible to obtain the right kind. In either event, the foreman should know exactly what has happened, so that in the future he can choose more wisely, if the fault is his own, or can see that the purchasing department supplies him with the proper kind of material. As for all the other faults, spoilage, etc, it is entirely the duty of the foreman to eliminate to the greatest possible extent such causes as tend to increase the cost of the product in his department. It should be evident, however, that no foreman can properly or intelligently act in the best manner unless he is thoroughly posted in respect to what is taking place.

The information in a cost report for use by a foreman should be prepared and presented in such form that he will not have to dig through a mass of figures to discover the information he needs. The report should be timely and easy to understand. Cost reports that are cluttered up with detail to such an extent that foremen do not have the time and often the ability to sift out the information that they want and need are worthless. Reports should contain just enough detail for intelligent analysis of the activities of the foreman's department to permit comparisons of each element of cost in the department with standard costs.

If the cost reports furnished the foreman show that certain expenses in the department are increasing, or costs of certain products are showing an upward tendency, the foreman can be aided in locating the cause of the adverse showing, and his attention is directed to matters of importance instead of being diverted to comparisons of trivial details, which may be of no particular importance to the successful handling of his individual department by that particular foreman.

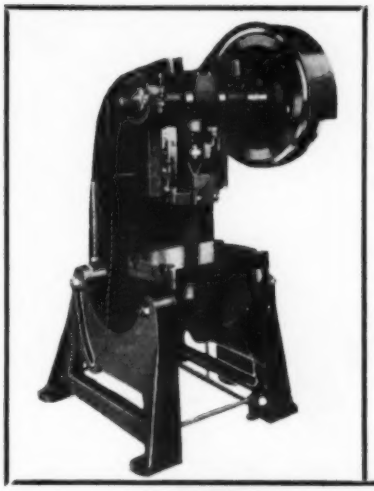
A good cost report for the foreman would be one which shows com-

parative product costs. Each month a comparison should be made of the cost of each product during previous periods. The information can be secured from the summary of finished production orders for the month, which summary should be classified according to the various products manufactured. The total cost should be analyzed to show the amount of direct material, direct labor, and applied manufacturing expense, which entered into it. All of the amounts should be reduced to a cost-per-unit to permit comparisons to be made between months in which the production varied in amount. A good arrangement of the comparative statement is to use a number of columns, having one column each for the high and the low monthly costs of the previous year, one column for average or standard cost, and one column for each month of the current year. The nature of all changes can be noted readily.

Comparative productive hours costs are necessary to show the fluctuations in the amount of expense necessary to carry on operations for each hour spent on production. If a comparison of productive hour costs is valuable as a means of controlling expenses within a department, a comparison of operation costs is still more valuable, because it shows whether the department is producing at a reasonable cost per unit.

The accounting department which furnishes cost reports should remember that the form in which a report is presented has considerable bearing upon its understanding and use by the foremen and it is well to adapt reports to the mentalities of those for whose use they are intended. As a usual thing, major executives and those who are "figure-minded" can secure the greatest value from reports in accounting

"I've just got my degree in business administration. How about your firm joining up with me?"



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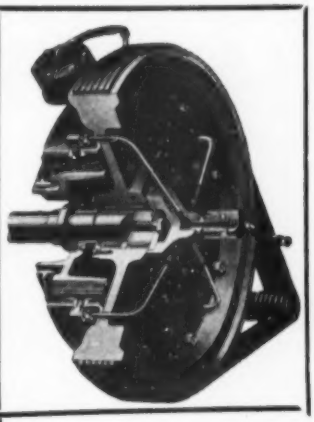

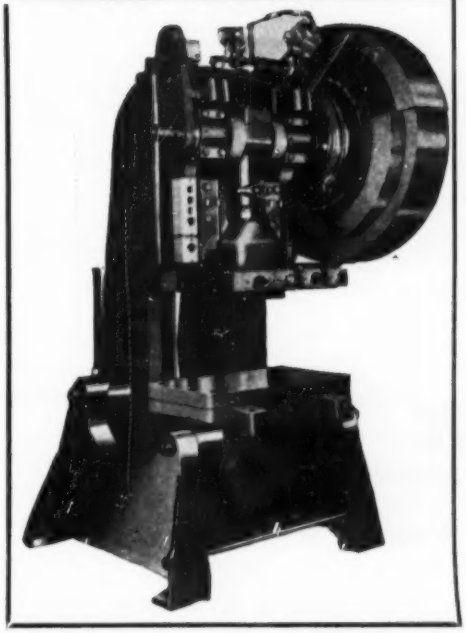

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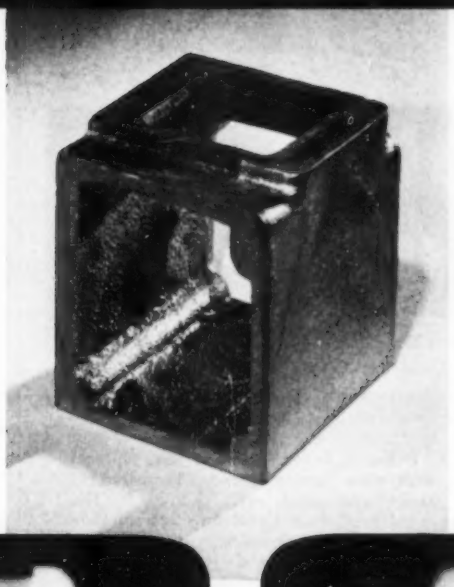
and statistical form. For those who are not figure minded, as is true of many foremen, a report in narrative form may be more easily understood. Such a report may be in the nature of a letter with explanations of points that may be misunderstood. Graphic charts are nearly always helpful in securing a thorough understanding of the important points of a report. The reports are in many respects a sales argument for better management, and the principles of written salesmanship can well be applied to their composition.

Nearly all reports are better understood if there is some personal discussion and explanation of them. They may be discussed by a person who has helped to prepare them, by a superintendent with his subordinates, or at meetings of groups of executives. Whatever the method, the discussion should be carried on in a helpful rather than a dictatorial manner. This requires that the person who handles the discussion should have something of the attributes of a teacher and should be able to explaine and convey understanding. As a rule, the personal method of explanation is preferable because the embarrassment of criticism before others is thereby avoided. Whether discussion of reports at meetings is helpful depends largely upon the nature of the meeting. If a meeting results in a "yes-man" attitude, as often happens, it is seldom of value.

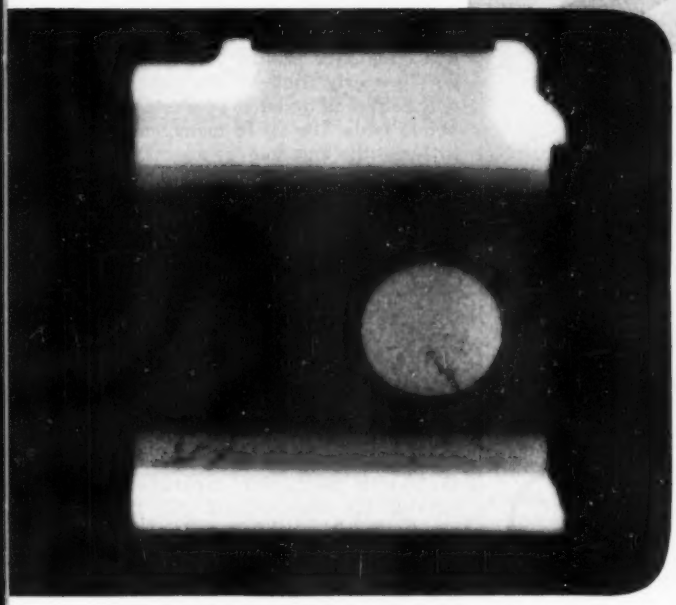
Of course there are many foremen who think that cost reports are a lot of useless and unnecessary paper work on the part of accounting department as far as the foreman is concerned. Here is where an educational program by management to inculcate the value of cost information for foremen is necessary. Foremen must be made to understand the effect of direct labor hours on fixed

"Don't bother having him come in, Miss Fender, just tell whoever it is that I'll give him a raise."

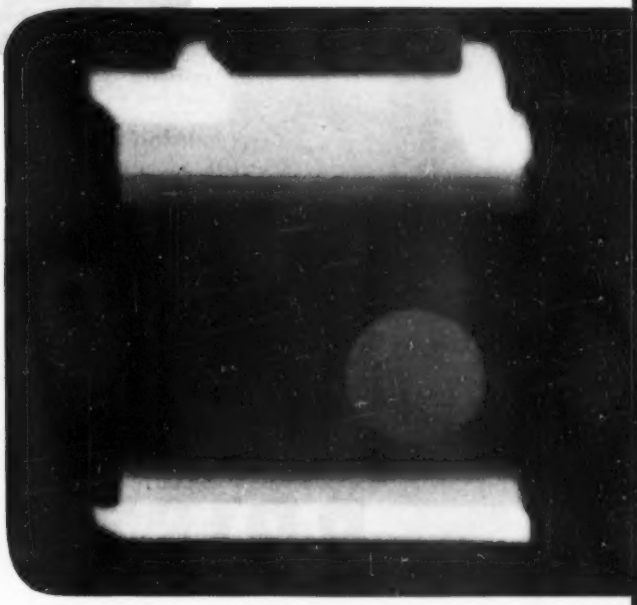
When shrink occurs...



Yield shrinks, too...



Radiograph shows recurring defects due to shrinkage.



A change in gating produced sound castings.

Radiography helps avoid shrink

Shrink can pose a real problem in casting 355 aluminum. It did with this instrument housing.

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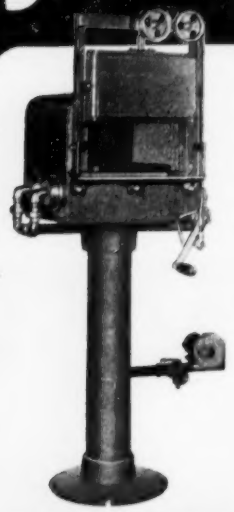

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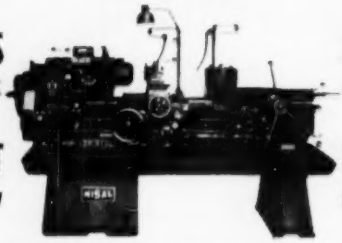

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costs. They should be on the alert to keep the total of direct labor hours well up to the most profitable point. To do this every foreman should study the fixed and variable costs of operating his department so that he may better understand when this most profitable point has been reached. It is the foreman's responsibility to devise ways of cutting costs. Foremen are employed to assist management to increase profits. Unless foremen in a plant understand what makes profits, and how they as individuals can help to control profits, they cannot do justice to themselves or to their jobs.

"It's no use filling your pocket with money if you have a hole in the corner of it." The hole of needless costs saps profits. The cost report properly used by the foreman will help plug up holes of waste and undue costs. It's up to management to keep the foremen aware of the importance cost-wise of all jobs in the shop.

What some foremen object to in cost reports are the effort and time it takes to wade through the mass of figures to get at the meat of the reports. They claim they keep their own records of their direct labor and material costs, and do not care what overhead is determined by the front office; they couldn't change it anyhow. What these foremen want is a breakdown on the cost of operating their own particular departments, not all the departments. All they want to know is how their particular group is doing as far as cost of operating, direct and indirect labor, material and expenses, waste, spoilage, and overhead are concerned.

In my opinion, a foreman is shortsighted in being only concerned about the cost of running his own department alone. A consolidated cost report covering the entire plant is of value to every foreman. It has a certain nuisance value; it not only makes the foreman more cost conscious but fosters a spirit of competition by letting each foreman know how other foremen are cooperating cost-wise.

Harry Kaufman
Philadelphia, Pa

I DON'T THINK any foreman should be troubled with a lot of figures or clerical duties. If he is kept in his office reading figures or writing reports, he'll certainly neglect his real duties, which should be to lead his boys and prepare jobs for each man in his department. If a foreman has any time to spare, he should use

these hours to search technical magazines for better methods, tools, or how to handle his production more efficiently, rather than tie himself down studying numbers.

From Ed's remark that there was a lot of good information in the report if you can dig it out, I suppose the report was a big one, which took hours only to read through carefully. If that's the case, I think either Al's or Ed's departments are too large as they seem unable to check the economic transactions within their departments and therefor must accept such information from the office,—or else these two foremen are poor organizers. But I agree with Al not to expect a foreman to get any work done if he has to spend much time on a mess of figures.

As Ed doesn't tell what costs should be compared with other departments, it's difficult to know what he's driving at. As I see it, it's only a waste of time for any foreman to spend his time reading reports. If Ed and Al are foremen with a good sense of production costs they should never rest until they are sure their departments work so efficiently that no economic report could show figures that were better than those they have created themselves. That makes all reports from the front office unnecessary. If there are tendencies to raise the departmental costs, a foreman should be prepared to counteract before any report from the office has reached his department. But no foreman's office should be turned into some kind of "papermill."

Yes, overhead is increasing not only because of writing this report, but all the more if it increases to cover all departments. It is up to Ed and Al to show cost figures in their departments that not even the front office can beat.

A E Fristedt
Stockholm-Bromma, Sweden

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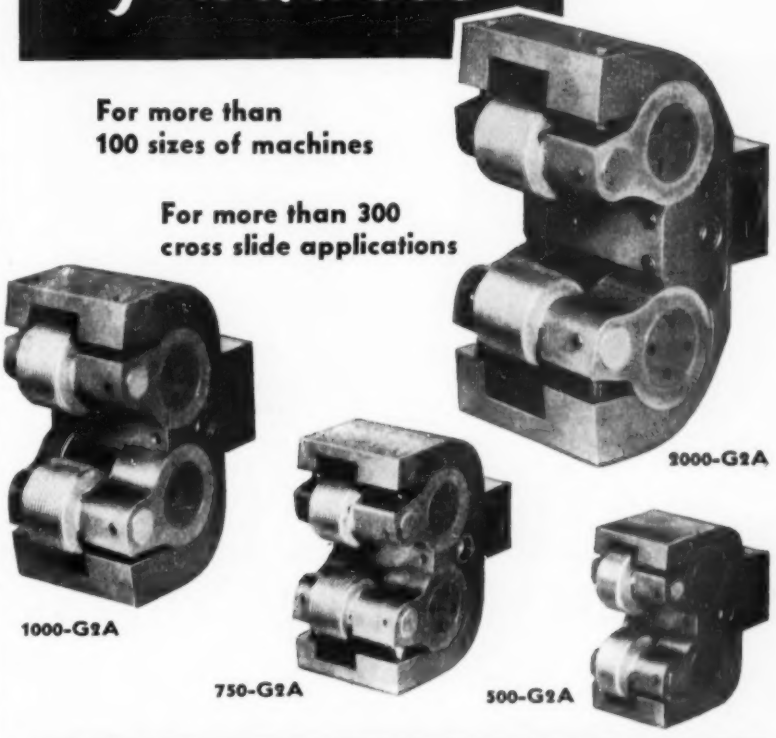

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In the rapid strides which industrial companies have made in the last thirty years, we have lost much of the closeness of control of cost which was previously present. The tempo which built up to our present-day methods of production and living has required the time and effort of company management to meet production schedules.

Too many companies were not adequately equipped to cope with all phases of the fast-moving times. They neglected to strengthen all parts of their organization, and now when times are a little slower, they are beginning to realize the mistakes.

The training or education of lower supervision in the ways of present shop or company management has been one of the sorry spots in our fast growth. Because we needed production and needed people to look after that production, too often we just picked a man from the rank and file and put him in charge. This man had the ability to guide people and knew the production problems, thus he served his purpose. Yet he was not a full-fledged foreman in the terms of yesteryear. He was not given the necessary information to know how the company operated internally.

Always remember that the workers of a company judge the company by its foremen and not by the board of directors. Therefore, the foreman must know the company policy, cost methods, business level, and how to do his job better. From this we realize that costs are important . . . so important that our foremen in industry must know how to use the information which cost control reports can give them.

Budget control, which is the general form of control report, is a must today. But if your foremen are like Al, who sees no good in them

"I didn't get the raise, but he promoted me to a machine with a hydraulic chuck!"

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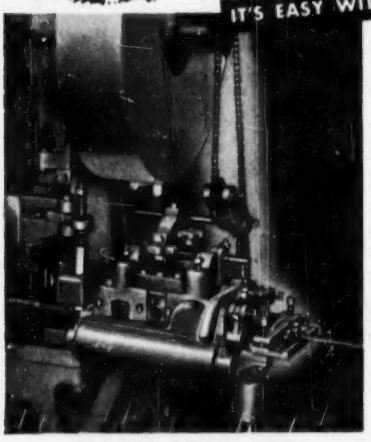

Wittek automatic roll feeds fit all makes and sizes of punch presses—provide maximum efficiency and extreme accuracy in the high speed automatic feeding of strip stock. Made in single roll, double roll, and compound types with straighteners, in models to feed (push or pull) in any direction. Length of feed is easily adjusted to meet individual requirements.

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Simplify Handling of Coiled Stock

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Automatic ROLL FEEDS AND REEL STANDS

because he cannot understand them, they are just wasted paper.

A foreman can learn the value of costs and how to use them if higher supervision will take the time to help him understand the principles of the system. No individual will praise or use a system he does not understand. The natural reaction is that of self-protection which sets up a pattern causing the individual's mind to black out reason, thus making a perfect alibi for not believing in the idea. Self-protection is a strange thing and comes to the foreground in many ways. The reaction of Al to the cost records is nothing more than self-protection due to his unfamiliarity with such things.

The study of budget figures properly prepared by a foreman is not a time-consuming item. Very shortly the foreman who knows the use of such records can compare his results with past performance or with the other departments. He must have the full data on his operations. It is a small business within a business and must be operated successfully and economically, otherwise the whole organization will fail. It is the old story of the whole being no stronger than its parts or its weakest spot. So we must see that our foremen begin to understand business management. Only one way to accomplish it—by education.

Charles D Townsend
West Hartford, Conn

•

RUSTY

Does a man lose touch—become rusty—away from his trade? Should you hire back an ex-toolmaker who hasn't been at the job for the last ten years? Here's what readers think . . .

I THINK Ed's suspicion about a man having been away from his trade for ten years is superfluous. If that man had learned his trade a decade ago it should be very easy for him to pick it up again.

I used to design tools about 25 years ago, and recently received a request to help a firm reorganize. I made drawings for several jigs, fixtures, and dies. I didn't feel any less efficient than I did a couple of decades ago; on the contrary, I think I was much further advanced because of the experience I had gained in the intervening years.

If Ed was short of toolmakers he surely missed a man who might have given him good service. On the other hand I think being away from a trade 40 years is too long a spell for any man to be efficient on the same

kind of work. In that length of time materials, methods, and machines have changed so much that our man certainly would be out of date if he tried to pick up the trade in which he used to work in his youth.

Ed's argument that a man who has not been working in his trade for ten years would not be interested in toolmaking now is no argument at all. How does Ed know that it's our man's lack of interest in that trade that's kept him away from toolmaking for ten years? To me it looks as though he was very much interested by coming back after so many years, otherwise he wouldn't have asked for the same kind of work. Doesn't Ed understand he might have made more money in some other occupation that has now ended? An old tradesman in good health is no more difficult to break in at a new place than a young guy. Doesn't a young fellow also have to feel his way around and get used to the organization, fellow workers, and tools at the place too?

I agree with Al that ten years for a good man doesn't make much difference. At least he would be much better than a jittery modern who never so far as had a chance to gain the experience that older men have gone through.

Why should a man deteriorate in his know-how because he's growing old? Doesn't that depend upon each man's attitude to his job? I know many young men who have deteriorated very badly. Ed makes a general statement about a condition that covers only a minority of men he's speaking about. I challenge any young guy to tell me anything that's happening in machine shops at large that I don't know at least something

"He tried plying with me flattery, gifts, liquor and they all worked!"

SPECIALLY ENGINEERED for today's high-speed finishing methods

If you want to take full advantage of the new laminated phenolic grinding wheels and discs . . . and of the most recently developed cleaners and polishes — these modern-as-tomorrow Millers Falls tools are made for you.

They're compact, rugged, beautifully balanced. In every detail, they're engineered to give the performance characteristics needed to make the most of the latest finishing methods.

The models shown here are just part of Millers Falls broad line of high-performance electric tools for production and maintenance. Each is designed and built to save time and produce better work for you at lower cost. Write for full information, or, let us arrange a convincing demonstration.

LIGHT, HIGH-POWERED

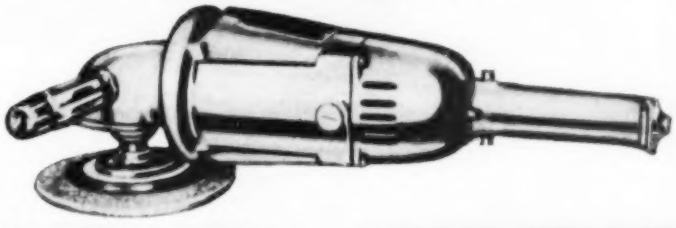
New No. 870 Sander

Weighing only 7½ lbs. — yet with a full 5.5 ampere rating and designed for continuous production use — this beautifully engineered 7" sander sets new standards in its field. No load speed is 4500 r.p.m., making the No. 870 perfect for use with the new laminated phenolic wheels and discs. In every way, an outstanding performer for fast sanding, wire brushing, grinding and polishing.

FASTER — MORE POWERFUL—

New No. 270 Polisher

Greater power (5 amperes) and a higher speed (1900 r.p.m.) make this newly designed 7" unit ideal for use with the latest-type cleaners and polishes which have recently found such favor. Light and compact, it handles beautifully and gets at the less accessible surfaces. It's supplied with a deep carpet-pile wool pad, the most effective polishing head ever developed. The No. 270 is also highly efficient for rubbing, sanding and grinding.



FOR HEAVY SERVICE—

No. 900 Sander

With 8.0 ampere rating, this powerful 7" sander has long been a favorite in hundreds of shops. Regularly equipped with flexible rubber and Co-ro-lite pads for sanding, it also offers exceptional, smooth-running performance with cup grinding wheels and wire cup brushes for a wide variety of finishing operations.

MILLERS FALLS TOOLS SINCE 1868

The Mark of Superiority

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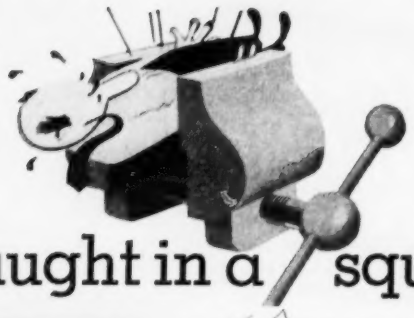


Caught in a squeeze?

with High Cost PRODUCTION Problems Involving . . .

Variety of sizes, shapes, materials . . .

Changes in consistency . . .

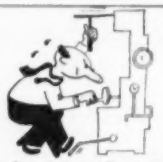
Heating, baking, drying, cooking . . .

Cooling or chilling . . .

Maintaining uniform tension on increasing or decreasing diameters on any web type of material . . .

Maintaining uniform pressure, weight, temperature or other variables . . .

Regulating conveyor speeds . . .



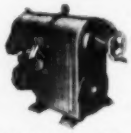
Synchronizing all working parts of one machine or machines working in series . . .

Cut production costs with **REEVES** SPEED CONTROL

• With overhead and sales costs soaring daily, there's bound to be a squeeze—and you, the manufacturer, are caught right in the middle! Greater efficiency and lower production costs are the only effective means of combatting these rising costs. Act now—Let REEVES *stepless*, variable speed control give your machines greater work range, accuracy and efficiency . . . simply with the touch of a button or the turn of a handwheel. Choose today from the complete REEVES line—now standard equipment on more than 2750 different makes of machines! Write for 132 page catalog. Specify Dept. A102-G.

Variable Speed Transmission: provides speed flexibility over 2:1 to 16:1 range. Fractional to 87 hp. Heavy duty applications.

Vari-Speed Motor Pulley: converts any constant speed motor to a variable speed drive. 4:1 speed ratio. Sizes to 10 hp.



Motodrive: combines motor, speed varying mechanism and reduction gears in one unit. 2:1 to 10:1 speed ratio. Fractional to 30 hp.

Flexi-Speed Drive: versatile, economical drive with 8:1 speed range. Mounts in any position . . . drives in any direction. ½, ¾ and 1 hp.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Variable Speed Control

about. I have always tried to learn something about everything and everything about something. However, if that fellow is fortunate enough to be a pioneer in a special case, it's no proof that he knows more than the older man who has a much broader experience.

Yes, Al, if given a chance to nimble up his fingers a former good toolmaker will do a better job than his modern brother. If given a chance to hire him I would prefer him to any young guy who thinks he knows everything but doesn't know by far what the other more matured man has learned.

A E Fristedt
Stockholm-Bromma, Sweden

WHEN LOOKING over the Round Table "Rusty" I thought of a fellow I knew who had been away from the trade for a good many years and then decided to get back into it again. He replied to an advertisement and went in to see the foreman. After he had introduced himself, and made it known that he had been away from the trade for some time and was desirous of getting back again, the boss did what he could to discourage him.

"We do fine work here and I'm afraid that after being away from the trade for so long you won't be able to adapt yourself as you did in your younger years—you know, we work to tenths here."

My friend didn't like the guy's looks and wasn't exactly in love with the looks of the outfit either, and consoled himself by giving the discourager a fitting reply.

"Well, I'm not quite *that* good, but I have worked to eights."

"Tenths!" my friend mumbled as he left the shop "I've found it just as easy to work to tenths as a plumber finds it easy to work to a foot."

The last few years have seen many an oldtimer return to the bench and they took a back seat for no young squirt. Rusty certainly, until they got the feel of steel again and then they were off as good as they were in their prime. When men of experience are in such demand as they are today it seems nothing short of silly to turn a man down because he has been away from his trade for a few years. He has all the fundamentals at his finger tips and, although he may be a little out of step with modern tools and methods, you can rest assured that he will soon catch on and be on the up-and-up, and as good or better than the

When precision finish is important

...start with the precision abrasive

ELGIN DIAMOND

At ALLIED MANUFACTURING COMPANY of Worcester, Massachusetts, a leading producer of special carbide dies and tools, they demand precision finishes . . . and they rely on Elgin Diamond in DYMO-C*, the precision diamond abrasive! Precision graded for absolute particle uniformity, Elgin Diamond assures uniform, predictable results with maximum cutting speed. Operators like it, too, because it comes ready to use—there is no need for mixing or preparation of any kind. Whatever your finishing need, Elgin offers a full range of Bureau of Standards grades, each distinctly color identified to give you finer finishes, faster. Every day, more and more leading producers find that . . .

Better results begin when you finish with diamond...

ELGIN DIAMOND
ABRASIVES DIVISION

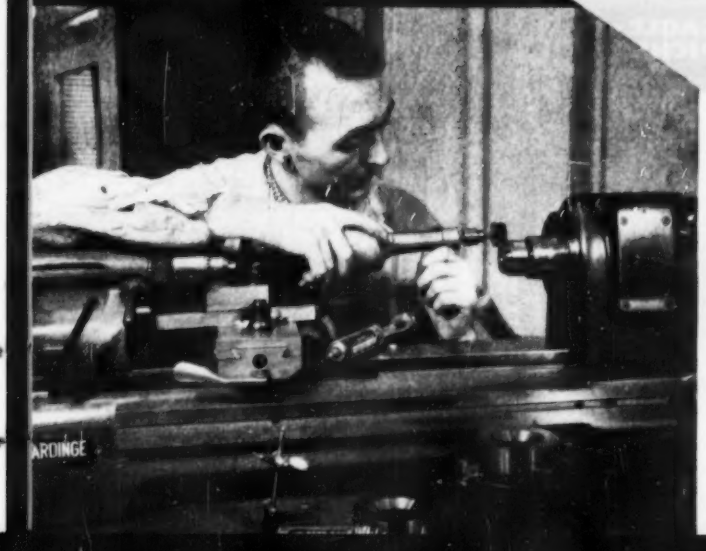
ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS
Dept. B

Ask for a free demonstration!

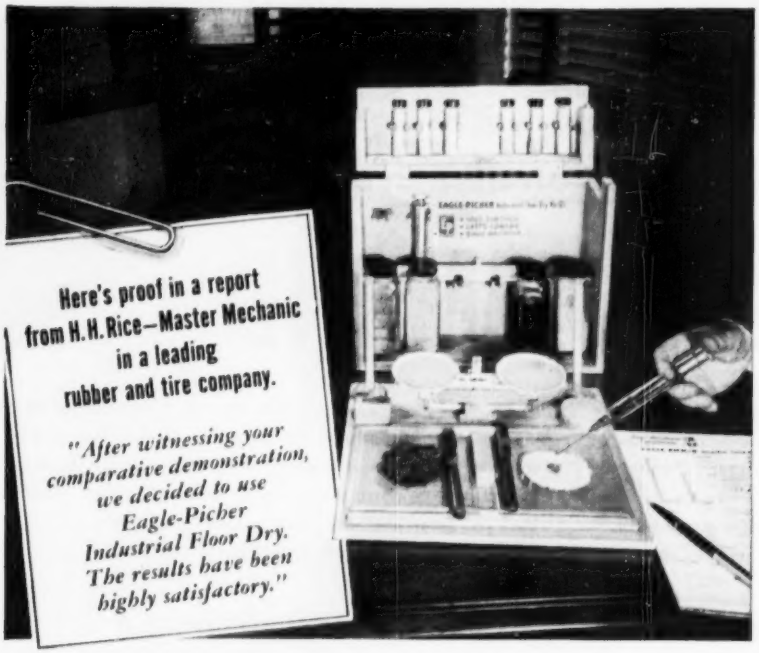
* C for Carbides.

Here, a carbide curling punch for forming the bead on flashlight casings is precision finished on a rotary felt wheel at ALLIED. ELGIN DYMO C, grade 30, is used in this operation for accurate sizing in less time.



This ALLIED operator is using a rotary felt bob and ELGIN DYMO C to polish carbide sizing pins. Again, Elgin Diamond meets ALLIED'S requirements for consistent accuracy and flawless finishes—every time!

There's a big difference *in floor absorbents*

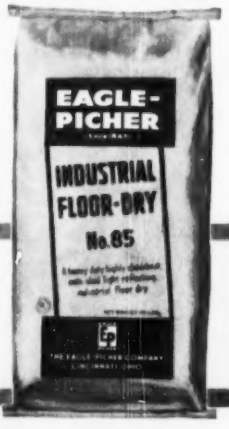

Here's proof in a report from H. H. Rice—Master Mechanic in a leading rubber and tire company.
"After witnessing your comparative demonstration, we decided to use Eagle-Picher Industrial Floor Dry. The results have been highly satisfactory."

You, too, can witness the difference in floor absorbents! With his portable laboratory, your Eagle-Picher man will analyze your floor absorbent *right in your office*. You may actually conduct the test yourself! Without obligation, of course.

Here's what the test shows—

- The amount of oil and water absorbed for given bulk.
- The cost of your absorbent in terms of absorption and coverage.
- The amount of coverage you're getting.
- The benefits of your absorbent in terms of safety and reflective ability.

You'll see that Eagle-Picher Floor-Dry is insoluble, chemically inert and non-combustible . . . that it combines light weight for exceptional coverage with light color for brighter, safer working areas. Write today for the full story.



EAGLE-PICHER INDUSTRIAL FLOOR-DRY No. 85

EAGLE EP PICHER

Since 1843

THE EAGLE-PICHER COMPANY

General offices: Cincinnati (1), Ohio

youngster who would be lost without his modern measuring tools.

I don't like Ed's idea of a machine operator being broken in as a toolmaker. Where's the comparison? You'll find that an ex-toolmaker will be able to train himself as soon as he gets acquainted with a few of the modern gadgets and machines; having had years of experience with others not quite so up-to-date, he may surpass the up-to-dater in short time. Ed, if you need toolmakers, hire a has-been and you'll have a good one who will be able to give you the benefit of his valuable experience—as old fashioned as he may seem.

You can't blame a man for quitting a trade if he happens to be attracted to something better. There are many today who are ranchers, making good money in chickens, or similar work, and enjoying the healthful rays of the warm sunshine. Many of the shops of yester-year were not as pleasant as are most of the shops of today and one could not blame a man for seeking the outside in order to earn a living. It doesn't mean that if a man quits a trade he is no longer interested in it; it means that he is more interested in his health.

You'll seldom see a man who has left toolmaking dispose of his toolbox. There's something about toolmaking that has a lasting effect, and many an hour one will spend rummaging through his tools and seeing that they are in perfect working order so that they will perform when called back to duty.

There are many who will not be able to adapt themselves to modern conditions and it is up to the foreman to see that they are able to carry on. A good man will soon show his boss whether he can cut the mustard and it is up to the fore-

"Yeah, your girl does have an hourglass figure but the sand's all at the bottom."

SuVeneer® CLAD METALS

Prospecting for more profitable product fabrication? You're in luck when you find how **SuVeneer** Clad Metals pan-out on your applications . . . in savings of expensive non-ferrous materials, in ease of fabrication, and in improved product performance. **SuVeneer** Clad Metals are composites of genuine copper, or brass, or nickel, bonded inseparably to plain strip steel on one or both sides. • You save from 70% to 80% of the solid strategic metals, while enjoying *all* their surface advantages. Write!

Superior Steel
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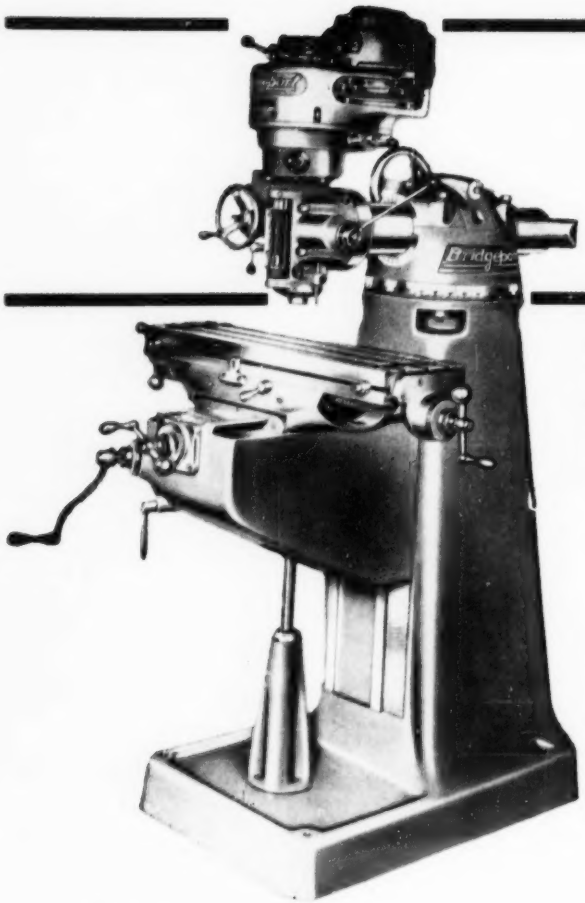
CARNEGIE, PENNSYLVANIA



Bridgeport

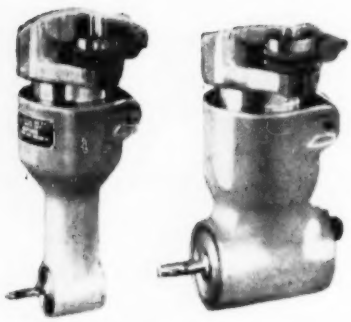
The Machine that mills, drills, bores and shapes at all angles with one set up

DESIGNED, BUILT, KNOWN and ACCEPTED...for today's and tomorrows requirements

The BRIDGEPORT TURRET MILLING MACHINE . . . familiarly known in metal working shops as the "Bridgeport Miller" . . . is in a class all by itself in versatility, utility and accuracy. It is not only several machines designed and built into a single unit, but it performs each of its individual functions equally well . . . with highest precision.

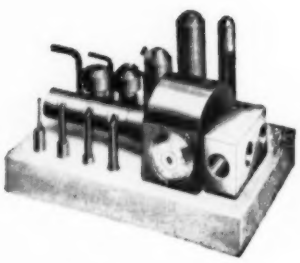
There is never an idle moment for this outstanding machine tool, recognized and accepted as a "must" in the hundreds of modern tool rooms and die shops where it is in daily operation. It is, in fact, the "busiest machine in the shop" because of its capacity to handle repetitive small work on a production basis.

Get all the facts concerning the "BRIDGEPORT" . . . from your nearest dealer or from us direct. Investigate the attachments available.



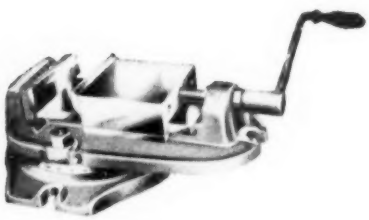
RIGHT ANGLE ATTACHMENTS

Left) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities. *(Left) Heavy Duty* . . . for milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.



No. 2 BORING HEAD

Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



MILLING MACHINE VISE

An improved vise providing great gripping power. Streamlined for attractiveness; equipped with coolant trough. Rigid holding assured by large diameter screw. Two sizes: 5" x 3½" and 6" x 5" jaw openings.

Get complete information TODAY.

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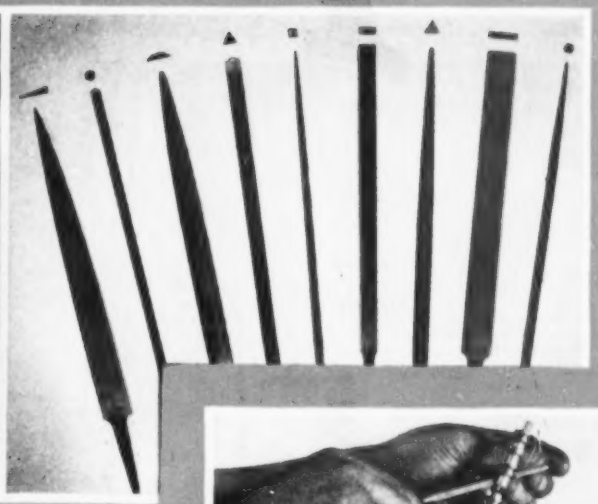
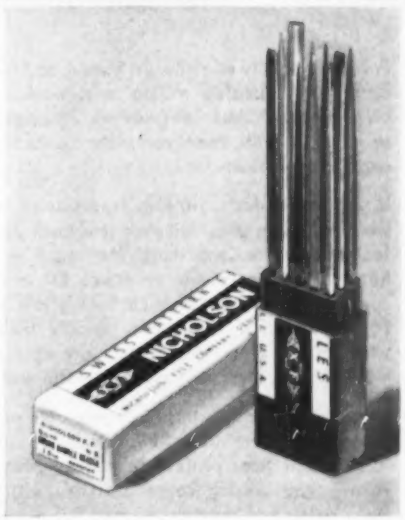
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

For those close-tolerance filing jobs...
Nicholson TRADE X.F. MARK Swiss Pattern Files





"WHEN it's got to be *right*, you've got to be *sure*." That's one of the creeds of the tool, die, model and fine-instrument crafts. One rule toward achieving accuracy in precision work is to use tools which in themselves are correct and of the highest efficiency.

For true fits and fine finishes there can be no compromise on file quality, no equivocating on file cost. Nicholson recognizes this principle, and puts "everything it's got" into putting excellence into X.F. (meaning *E*xtra *F*ine) Swiss Patterns. The shaping, cutting, hardening and finishing of these special file types is in the hands of specialists who work on nothing else.

Nicholson X.F. Swiss Patterns differ from American (regular) Pattern files. They are relatively smaller and finer in cut. Tapers are longer and more pointed. Cross sections are more varied. Individual types include those shown above (left to right)—Knife, Round Straight, Half Round, Metal Saw, Square, Pillar Narrow, Three Square, Equaling, Round Tapered. Others: Hand, Warding, Crochet, Barrette, Slitting, Crossing, Corrugating, Joint, Pippin, Testing. Group assortments: Die Sinkers, Die Sinkers Rifflers, Filing Machine, Broach, Round and Square Handle Needle (in 1-doz. plastic-case assortments if desired).

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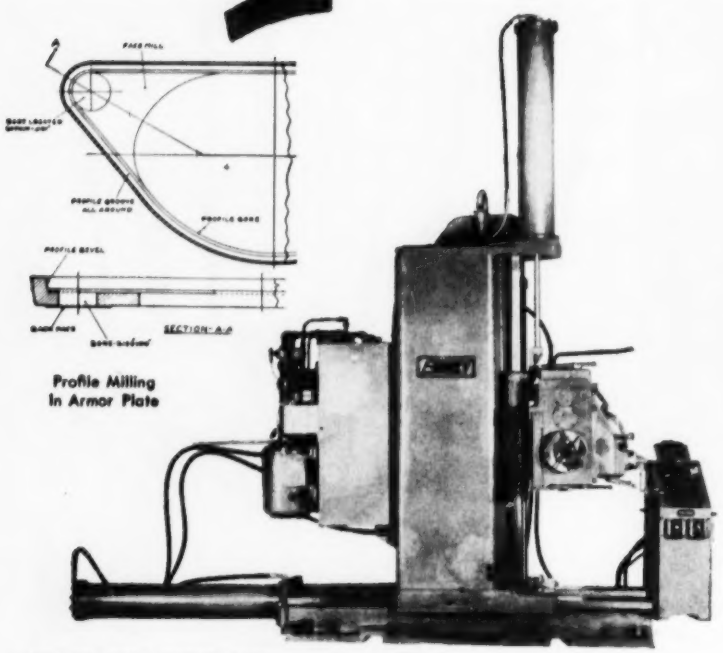
NICHOLSON FILES FOR EVERY PURPOSE

FORNEY 1ST

IN SOLVING INTRICATE PROFILE MILLING AND BORING PROBLEMS



Profile Milling In Armor Plate

—UNRETOUCHED PHOTOGRAPH

Forney specially engineered boring and facing machines make irregular, complicated profile milling and boring jobs routine. Difficult work on aluminum and magnesium castings and forgings is easy and economical with these complete "package", ready to run, horizontal profiling machines.

If you make spars, rib chords, fuselage bulkhead segments, wing ribs, wing hinges or other aircraft structural parts a new Forney boring and facing machine is a must. The same is true if you machine escape hatches, power mounts or drives for armored vehicles. You'll do any complex profile boring and facing job better for less with a Forney. Forney machines feature a spindle housing as a motor power unit which moves directly into the work face. This results in more accurate work, more power and rigidity in the cutting tool.

These custom made machines may be equipped with any type duplicator equipment with templates. Top quality work holding fixtures, tooling and floor plates are also available. Write or phone us today. Forney engineering consultants are ready to serve you immediately upon receipt of your drawings.

FORNEY'S INC.

Manufacturers of Special Machinery Since 1916

207 ELM STREET NEW CASTLE, PENNA.

man to detect pretty quick whether a man is fit to keep on the payroll.

I have in mind a particular fellow of my acquaintance who was a most skillful individual with a pair of calipers. He could make a fit to a predetermined tonnage any time he had a mind to; he could take an old worn-out machine from the scrap pile and have it running as good as new in a short time, but when he tried to acquaint himself with a micrometer he just disintegrated — skillfully, psychologically, and spiritually. He'd run to one or the other machinists throughout the day and look at them over the top of his specs as he gave vent to his utter disgust.

"How do you read this damn thing?" he'd blurt out—mad as hops. Finally he submitted to the march of progress, slammed the lid of his toolbox and pulled out to stay.

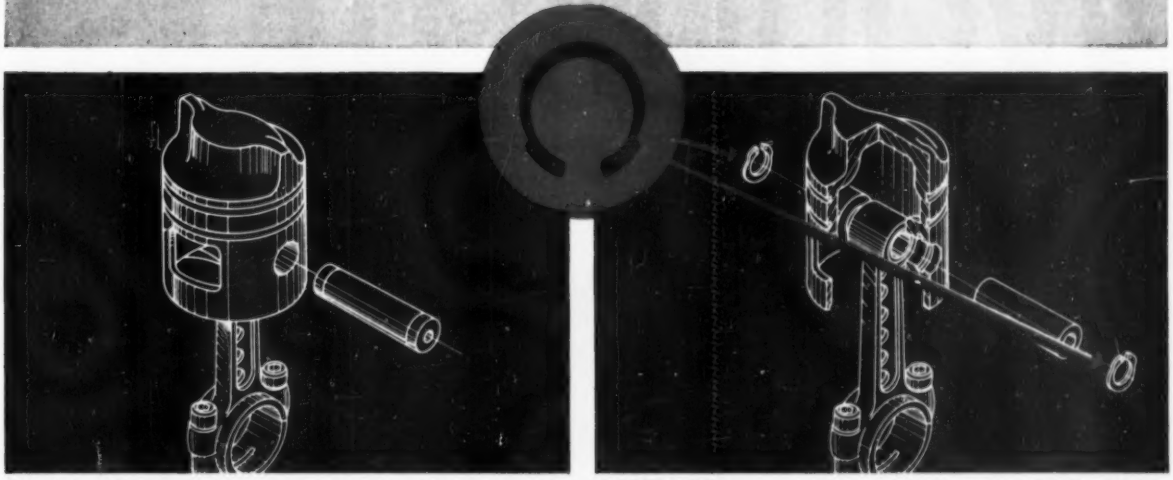
So there you have it; there are many who are well suited to carry on in the modern world while there are a few who are utterly incapable of grasping the modern trend. Just because there are some who cannot fit in with modern methods doesn't mean that all should be discarded to the scrap heap to die of a broken heart.

J Homewood
Tujunga, Calif

DOES A MAN become rusty away from his trade? A great deal will, of course, depend on the quality of the man concerned and more even might depend on his reason or reasons for leaving his trade in the first place. If a man is a first-class tradesman from the point of view of skill and initiative, is keenly interested in his trade, and is compelled by circumstances which he cannot control to engage in different em-

"I suppose you're going to tell her the foreman made you work overtime again!"

2 Waldes Truarc Rings Replace 2 End Plugs ...Eliminate 3 Operations...Save $.066 Per Unit



OLD WAY Two inserted-plug type wrist pin locks hold wrist pin in place. 3 operations involved: costly machining, pressing in place, post-assembly machining. Costly maintenance problem—resulting from end plugs hammering loose.

TRUARC WAY Two Truarc Inverted Retaining Rings (Series 5008) hold wrist pin in place. Truarc Rings snap into grooves easily cut in piston, provide positive lock . . . practically eliminate maintenance costs. Quick assembly, disassembly.

Titan Chain Saws, Inc., Seattle, Washington, uses 2 Waldes Truarc Rings to replace old-style inserted-plug type wrist pin locks in their Titan chain saws. Use of Waldes Truarc Retaining Rings eliminates 2 press fit end plugs. Machining of plugs, pressing in place, finish machining—no longer required. Truarc way holds rejections to a minimum. Unit efficiency is greatly increased.

Redesign with Truarc Rings and you, too, will cut costs. Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better job of holding parts together.

USE OF 2 WALDES TRUARC RINGS PERMITTED THESE SAVINGS PER UNIT:

OLD WAY	
Cost of 2 end plugs Cost of pressing in and machining	$ .169
TRUARC WAY	
Cost of grooving piston Cost of 2 Truarc Rings	.103
Saving per Unit	**$ .066**

Waldes Truarc Rings are precision-engineered . . . quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

For precision internal grooving and undercutting . . . Waldes Truarc Internal Grooving Tool.

SEND FOR NEW CATALOG

WALDES

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REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 2,382,947; 2,382,948; 2,416,852; 2,420,021; 2,428,341; 2,439,785; 2,441,848; 2,455,185; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,308; 2,509,091 AND OTHER PATENTS PENDING.

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print) AM-095

Name_____

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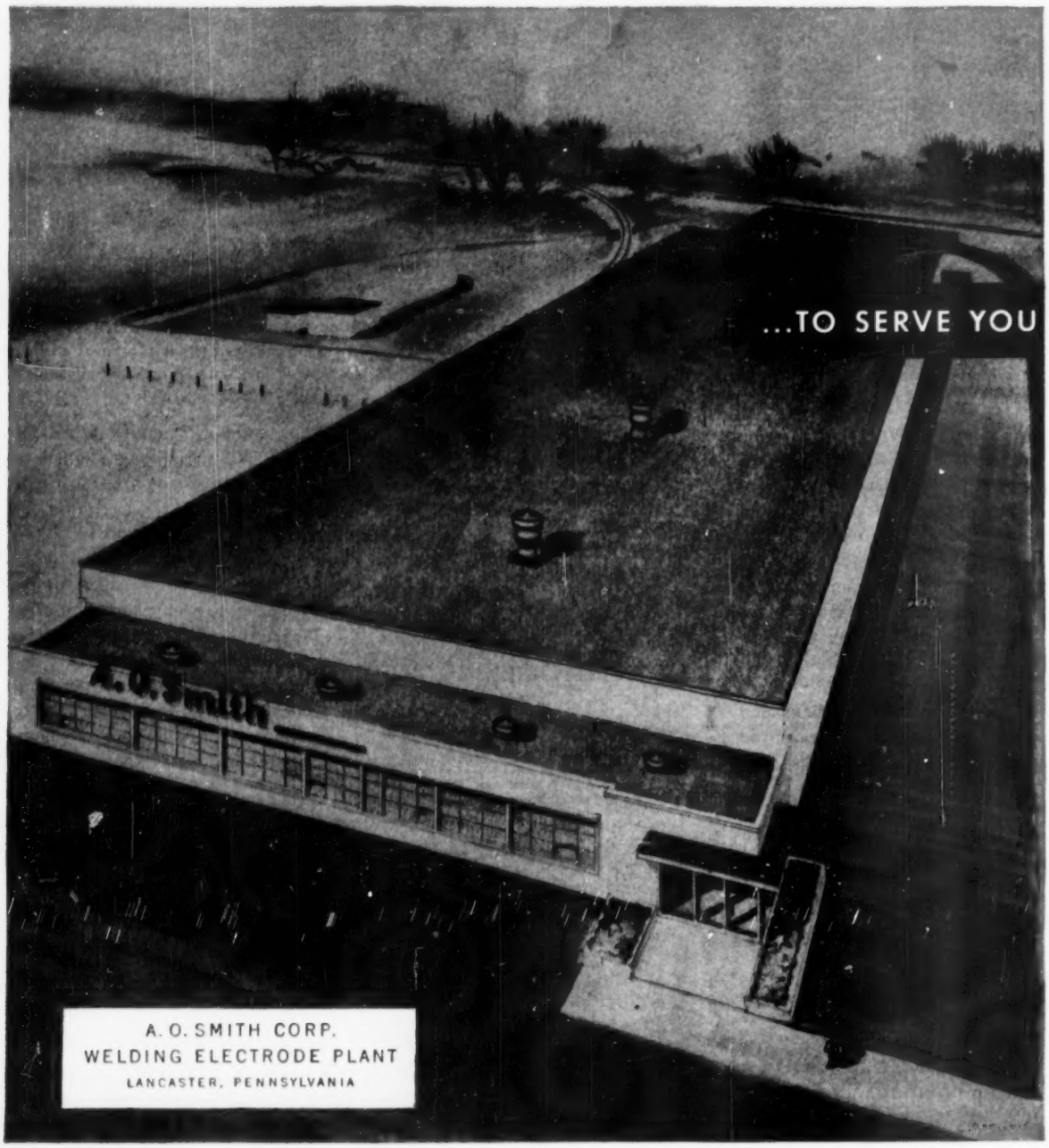
Now adding to our electrode production...

World's most



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welding electrode plant!

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Additional capacity for the production of A. O. Smith welding electrodes is represented by this "automatic factory," now in operation near Lancaster, Pennsylvania. Consistently high quality shielded-arc electrodes are being produced here by automatic machines in a glazed tile structure that assures the cleanliness needed for optimum quality control.

Maximum uniformity of electrodes is assured by rigid production controls including controlled air throughout the plant and the industry's newest and most efficient baking ovens. Straight-line production, with raw materials entering at one end and finished, packaged electrodes emerging at the other . . . means top quality electrodes for your production requirements.

Your demand for quality electrodes can be more quickly satisfied because of this new facility. The Lancaster plant will enable us to serve our Eastern customers on practically an overnite basis, as well as improving delivery to A.O. Smith users everywhere. For complete information on the entire A.O. Smith electrode line . . . as well as on machines and accessories, write:
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WELDING PRODUCTS DIVISION, MILWAUKEE 1, WISCONSIN

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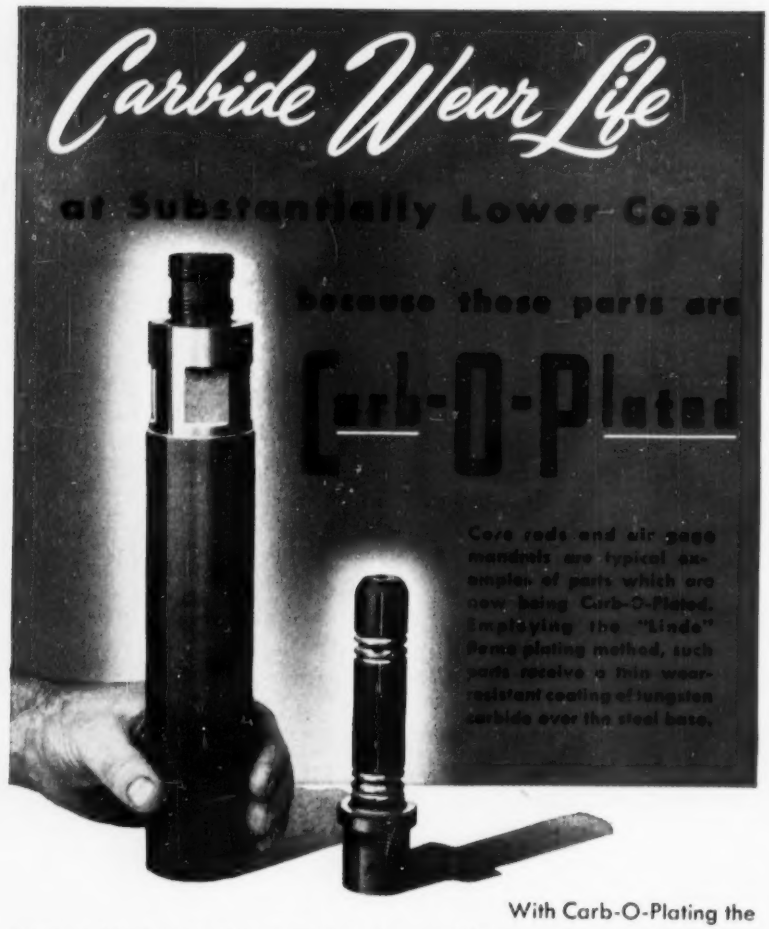
Carbide Wear Life
at Substantially Lower Cost
because these parts are
Carb-O-Plated
Core rods and air gage mandrels are typical examples of parts which are now being Carb-O-Plated. Employing the "Linde" Perma-plating method, such parts receive a thin wear-resistant coating of tungsten carbide over the steel base.

With Carb-O-Plating the wear-resistant advantages of tungsten carbide are provided for parts which could not be produced from solid carbide or where, if the solid material was used, costs would be prohibitive.

In the case of core rods used in the powder metal industry, a part of the size illustrated would be highly expensive if produced of solid carbide. By Carb-O-Plating a steel core rod, an ideal combination of advantages is obtained—the part cost is low; the steel core provides toughness to resist shock; the tungsten carbide coating gives excellent wear resistance.

Parts such as the gage mandrel shown could not be made of solid carbide because of machining problems to be encountered. Here Carb-O-Plating provides carbide life for all wearing surfaces. Carb-O-Plating may be the cost-saving answer for your wear-resistant parts.

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THE PLUS IN PRECISION

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DESIGNERS AND MANUFACTURERS OF: SPECIAL AND STANDARD CARBIDE CHROME PLATED AND STEEL GAGES
CARBIDE ROTARY FILES • ALSO FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION

ployment, he is not likely to go completely dumb in the matter of skill, interest, or initiative, even after a prolonged absence. This, I feel, will hold good in the case of high-grade tradesmen for so long as their mental and physical powers remain unimpaired.

If the absence is prolonged, the tradesman on returning to the bench or machine will, undoubtedly, have to contend with the technical and practical progress made during his enforced separation. Much of this progress may well be revolutionary and some of it may be merely nominal, but the high-grade, previously experienced, interested man would make short work of such a handicap and would be a more attractive proposition than, say, the newly fledged, lightly tested applicant.

It seems to me that Ed is rather sweeping in his condemnation when he says "I need toolmakers, not has-beens. What's more, I want men who are interested in toolmaking; not guys who quit the trade." In two world wars we here in Britain, with our heavy services commitments and our comparatively limited manpower resources, have had a wide and interesting experience with the type described by Ed as "has-beens." During those two emergencies we referred to them as "dug-outs," men who had retired on age limit for anything up to ten years. This was a severe, large-scale test, in advance of Ed's current theory and it had very gratifying results. We had our failures, of course, but the great majority did yeoman service and played no mean part in every field to furnish the tools which helped to finish the job. Actual deterioration among the old "uns" was amazingly light and their delight and enthusiasm at being once more in harness cancelled out any temporary strangeness due to change and progress. A high percentage of the dug-outs could have lived comfortably

"I don't know what he's working on—and I'm afraid to ask him . . . He used to be with the Atomic Energy Commission . . ."

for BETTER Surface Grinding Use QUALITY Segments

Facts about BAY STATE segments . . .

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4. PRICE ADVANTAGE. BAY STATE's special 8A abrasive, at a non-premium price, will work wonders on your tool room surfacing jobs . . . further, there is no extra charge for the BAY STATE bonus of outstanding, consistent performance.

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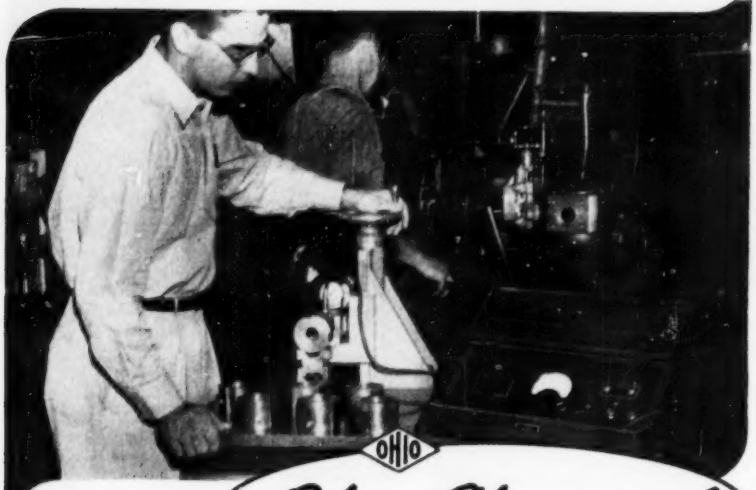
MEASURE IN MICROINCHES

Vital Operations Saved On Operating Tables



because Ohio Chemical uses the PROFILOMETER

The Ohio Chemical & Surgical Equipment Co. (a division of Air Reduction Co., Inc.) of Madison, Wisconsin is one of the country's largest suppliers of operating tables, other surgical equipment and medical gases. It is essential to Ohio that absolute precision of component parts of such surgical equipment be maintained for trouble-free operation at all times.

A typical example is the manufacture of electric-hydraulic operated surgical tables.

On the piston and piston cylinder operating table assembly, Ohio finds that proper functioning depends on precision surface finishes for smooth operation. Specifically, the "O"-ring of the hydraulic cylinder must be maintained to a precision surface finish for silent and effortless raising and lowering of the table—thus preventing the possibility of shock to patients during an operation.

Ohio depends on the Profilometer for accurate checks on all hydraulic surfaces. "The Profilometer gives on the spot surface roughness measurement and has saved the re-working of parts which previously failed in assembly due to surface finish," says Ohio.

Today, the Profilometer provides the fastest, simplest and most versatile means of obtaining dependable roughness ratings for all surfaces from a fraction of a microinch to 1000 microinches.

In your plant, too, the Profilometer can offer exceptional advantages as an all important shop tool.

To learn more about the Profilometer, write today for this free bulletin—"Practical Features and Applications of the PROFILOMETER". Micrometrical field representatives, traveling throughout the United States, will be pleased to show you an actual demonstration of the Profilometer at your request.

MICROMETRICAL MANUFACTURING COMPANY
formerly PHYSICISTS RESEARCH COMPANY
Instrument Manufacturers
ANN ARBOR 4 MICHIGAN

without working; this would seem to indicate that absence from work does not necessarily lead to rusting.

Here in the Glasgow area we have had a recent industrial experience which does not square with Ed's contention that a man rusts when away from his trade for a longish time. We have had the retrograde spectacle of two thousand engineers striking in protest against a returned absentee tradesman for earning too much money or, if you like, for working too hard. The "culprit," just past middle life, had left the tools some years ago to run a small business. He decided to seek re-employment at the tools with the company where he served his apprenticeship and, on being taken on, he worked to such purpose that he made bonus to the tune of 350/400%, against the average shop earnings of 75%. Due to the hostility of his brother tradesmen he only stuck it for about three weeks; he left of his own accord in order, as he put it, that two thousand engineers who were on strike because of, or against him, could return to their jobs.

The official reason given for the strike was that the "speed merchant" was not in the union, but he declared to a reporter "I applied to re-join the union but they would not have me; actually I was doing too much work and showing the others up." This may be an unusual case but it is a current example, and it supports Al's conviction, to which I also subscribe, that even a prolonged absence from the tools does not necessarily mean that the hand has lost its cunning. If the absentee was, originally, a really good craftsman, a short time should suffice to enable him to pull alongside modern practice which, in the main, should be so designed as to make skilled executions simpler, speedier, and easier, even in toolmaking.

Ed would seem to take too pessimistic a view of the problem, while Al seems to be too optimistic. Much depends on the quality of the individual. All oldtimers were not good ones. Distance, measured in years, lends enchantment to the view and we are prone to remember most the good ones who were our contemporaries and to forget the lazy and stupid ones.

Ed's high-handed, almost supercilious handling of the problem would not suit conditions ruling in Britain today where our problem is to fasten on to skill wherever it is to be found and, if necessary, to supplement it with refresher courses at the company's expense. If highly skilled labor is plentiful, then I

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now presents the sharpest,
cleanest, best cutting

HACK SAW BLADES ever made

Far Greater Dollar Value!
Longer Life!

AFTER long research, Disston has developed new equipment and new methods for making hack saw blades!—blades that are far superior in all respects to ordinary blades! —blades that promise users extraordinary benefits!

To achieve this, Disston engineers have had to give these blades the four qualities that any hack saw blade *must* have for clean, accurate cutting during a long service life.

Your Disston Distributor will give you an eye-opening demonstration right in your plant—a comparison of your present blades with the new Disston blades. It won't take long for you to see that these blades offer *better cutting, far greater dollar value, longer life!*

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Look for these qualities when buying blades

1. ***Uniform Hardness*** Proper heat treatment eliminates weak spots, reduces breakage. Blades must be straight and free of any sweep. *All Disston Blades are uniformly hardened!*

2. ***Accurate Set*** Character and degree of set must be accurately controlled so that each tooth does its share of the work. *All Disston Blades are accurately set!*

3. ***Sharp, Uniform Teeth*** Teeth must be truly sharp to cut efficiently. Contours must be uniform, for strength and effective chip disposal. *All Disston Blades have sharp, uniform teeth!*

4. ***Straightness*** Blades must be free of sweeps, humps, or hollows. (Note diagram below.) *All Disston Blades have parallel edges!*

For prompt service, expert advice, reliability, many economies SEE YOUR DISSTON DISTRIBUTOR

THIS IS THE CUTTING FLUID YOU TOLD US YOU NEEDED

YOU WANTED STRENGTH OF FILM
which would give you longer tool life

YOU WANTED LUBRICITY
to withstand pressure and reduce friction

YOU WANTED VERSATILITY
one cutting fluid to do 90% of all jobs

YOU WANTED GERMICIDAL PROPERTIES
no rancidity, freedom from skin sores

YOU WANTED COOLER WORK
which could be handled bare-handed

YOU WANTED LOWER COSTS
how's 8¢ a gallon, in the machine?

THE ANSWER IS:

ANTISEP

ALL-PURPOSE BASE

—not a mere water soluble oil, but a fortified concentrate scientifically developed to give you "100 oils in one!"

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PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

ANTISEP "saves the day" for Cleveland valve manufacturer—cuts cost 50%!

After several prominent cutting fluids had failed to meet requirements, this concern decided to try Antisep, diluted 25 to 1, in the machining of valve stems from 416 stainless steel. Warner & Swasey 5-spindle automatic screw machines were used. Result: lower costs, improved tool life, greater uniformity in pieces machined. Parts come off cool, permitting higher speeds and heavier cuts.

Ready to give you on-the-job service . . .

agree with Ed that it is desirable that men engaged should be interested in their particular line and anxious to remain in it. They should be modern in thought, outlook and training. Under such fairyland conditions the executive toolmaker's lot would, indeed, be a happy one from the labor angle, but in the prevailing conditions of a world shortage of skilled labor Al's commonsense down-to-earth remarks must be treated with respect.

There is no virtue in being an oldtimer if you are a bad oldtimer. Oldtime training was more selective as to the individual, perhaps more thorough and varied as to teaching, and good oldtimers—but only good ones—even after many years away from the trade should experience no difficulty in making a rapid comeback to their original standard of skill. Having "arrived," the final phase of catching up with current practice need not be a lengthy one.

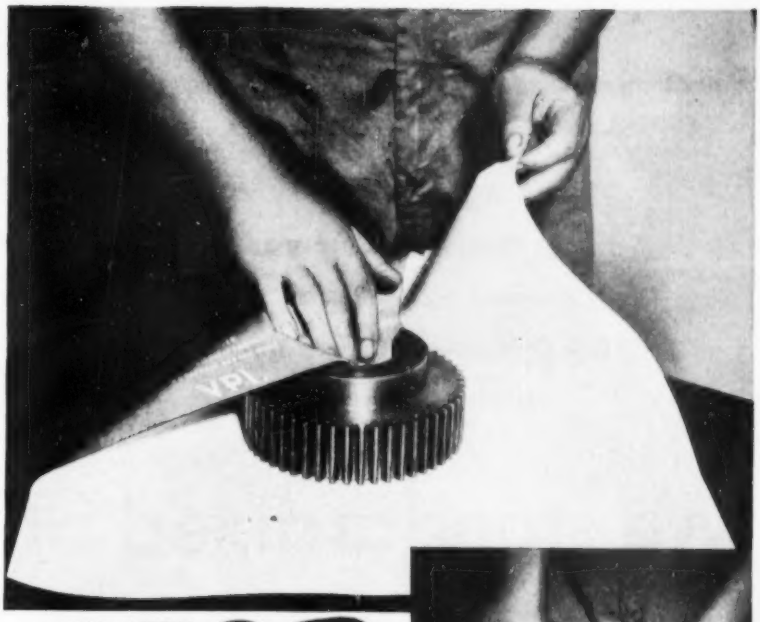
On the whole, there will not be much difference between the good old one and the good modern one. Old and young, the important factor is the individual. I line up with Al here, and if I had to make a rapid choice between an experienced man who had been away from the trade for some years and a raw, or inexperienced youth, I would go for the experience if the work involved was of high accuracy and urgently wanted.

M Donald

Lanarkshire, Scotland

WHEN A MAN has had his nose to the grindstone year after year, struggling to keep the wolf from the door, and decides for some desperate reason to give his abused beak a fighting chance to heal up by quitting the old trade and earning his livelihood somewhere else, you can count on it that he has a legitimate reason for doing so. Ed comes along and criticizes the guy for being fickle and, whether through prejudice or short-sightedness, condemns him for his act and refuses to give him the chance to prove himself. He fails to take into consideration that it is good for a man to get away from his business once in a while and partake of a refreshing change. Does Ed think that if he were to pull out for a year or two he would be no good for the job upon his return?

In this rapidly changing age of fast progress, where it is necessary for a man to flip over the pages of his trade magazine at a rapid clip in order to come anywhere near



STOP RUST

ORCHARD VPI PAPER PREVENTS RUSTING ON ALL FERROUS METAL PARTS & PRODUCTS

ORCHARD VPI is economical, easy to use, convenient to handle. This famous Orchard product protects ferrous metals from rust for years by releasing a vapor, which forms an invisible film on the metal surface. Perfect for automotive parts, engines, tools, machinery as well as heavy equipment and small arms.

VPI is economical; it eliminates the need for greases, and oils, keeping the metal part ready for immediate use. ORCHARD VPI is available in rolls, sheets, bags or shrouds for use with any product.

Manufactured in accordance with Military Specifications MIL-P-3420 and MIL-V-8574

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says **Norman Bonomo,**
assistant superintendent,
B & G Manufacturing Co.,
Pittsburgh, Penna.

Norman Bonomo, assistant superintendent, shows samples of his company's products. This nationally famous maker of aluminum windows and doors has been in business seven years—has tested leading makes of drills and standardized on SKIL.

"We standardized on SKIL Drills after testing 5 leading makes!"

"SKIL Drills were *first* in ease of handling, *first* in performance, *first* in low maintenance, and *first choice* of our employees," Norman Bonomo explains. "We make aluminum windows and doors for both commercial and private buildings and keep our power tools—especially drills—in constant hard use. Consequently, we ran extreme tests to determine which make of drill would give us best all-around performance with least service worries.

"Employees agreed SKIL Drills handled best with least fatigue—even in cramped places. Management voted for SKIL fast local factory branch service and low maintenance. No other brand measured up to SKIL!"

All 26 SKIL Drill models have these Features

Modern, Compact Design • Helical Gears • Die-Cast Aluminum Housings • Oversize Brushes • Reserve Power • Statically and Dynamically Balanced Motors • Optional speeds available on many models.

Capacities: ¼" to 1" in steel; 2" in hardwood • Speeds: 200 r.p.m. to 5000 r.p.m.

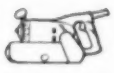
* * *

Harold Bildhauer uses a Model 45 SKIL Drill working on sash inserts. He states, "I handle about 90 or 100 aluminum inserts a day. And I use this SKIL Drill eight hours daily. It is easy to handle, easy to use, because I need less pressure with the drill's power and easy gripping. I'm sold on SKIL!"

For complete information, contact your SKIL

SKIL Saw

SKIL Driver



SKIL Belt Sander

SKIL Disc Sander

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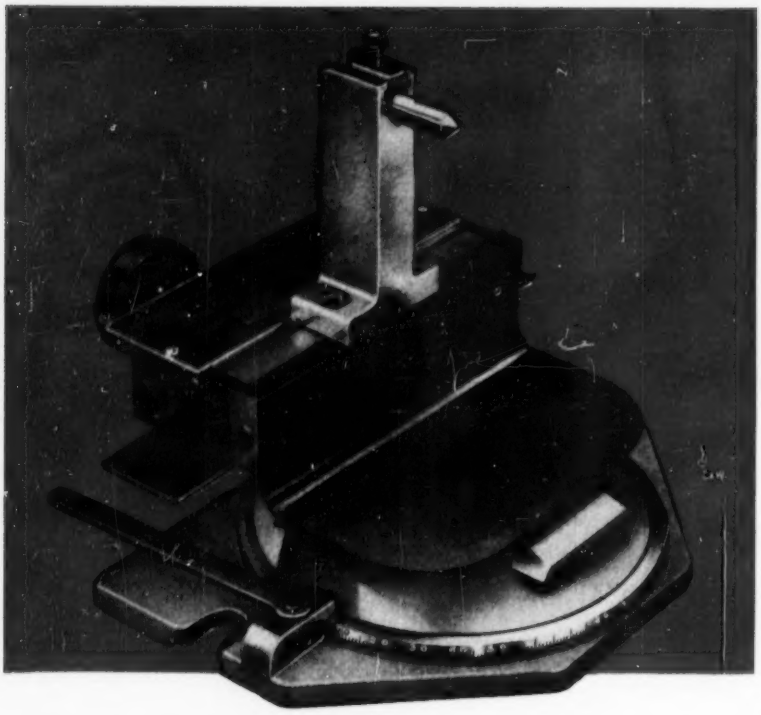
Factory Branches in All Leading Cities



Dress formed grinding wheels to a .0001" accuracy with the

B-1 Angle tangent to radius DRESSER

This easily operated formed wheel dresser is of sturdy construction and has exceptional built-in accuracy. Simple or complex forms can be dressed on grinding wheels to an accuracy of .0001". Years of use in thousands of plants have proved the worth of the Vinco Model B-1 dresser on production work as well as tool room and gage grinding operations.

Prompt Delivery

VINCO CORPORATION
9125 Schaefer Hwy., Detroit 28, Mich.

FREE! Send for this fully illustrated folder today. It's full of operating information and details concerning the famous B-1 dresser.

THE TRADEMARK OF DEPENDABILITY

VINCO
MILLIONTHS OF AN INCH FOR SALE

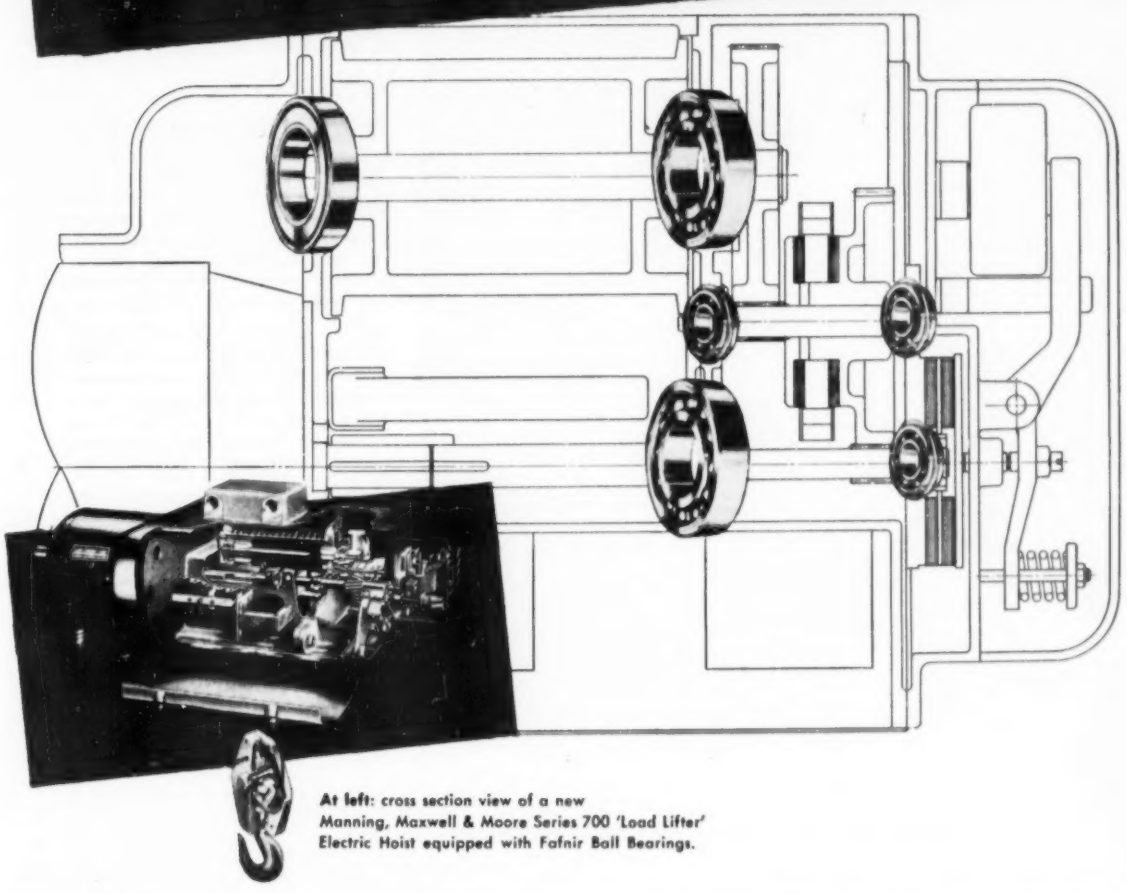
catching up on the advancement in tooling and methods, there is the chance of becoming outmoded pretty quickly unless he is on his toes as to what is going on. If he quits his trade and maintains his old love by reading up on what's going on in the world, he isn't going to retrogress, and will fit right into things upon his return. On the other hand, if he allows himself to shut out every contact with the business, he's going to atrophy in his upper story in matters pertaining to the advancements in the technical world and place himself in a position of being unable to catch up.

I don't see how Ed could be so dumb as to turn a man down and not give him a chance to prove himself when the man showed an eagerness to return to work. An older man may not be so hep to the modern gadgets, which he can soon learn about in short time, but you can rest assured that he will be a stabilizing factor. We need stabilizing factors in industry today and we'll continue to need them more and more as time goes on. You'll find that oldtimers who decide to return to the trade will lend their influence in no small measure.

Ed's claim that a man who has been out of touch with his trade gets pretty rusty and is unable to synchronize with modern trends, is all bunk. I think the fellow's reasoning power is a little bit warped and the poor guy is feeling the pains of mental senility. Just because a man pulled away from his trade for a spell is no reason to think that his past experience is thrown to the four winds. You can't rust the ideas

"Cheer up, chief—the 6 million pieces are only 0.007 undersize—suppose they were also out of round!"

How an "Industrial Muscle" is kept from getting "Muscle-bound"



At left: cross section view of a new Manning, Maxwell & Moore Series 700 'Load Lifter' Electric Hoist equipped with Fafnir Ball Bearings.

Every bearing indicated in the diagram above highlights the strategy of Manning, Maxwell & Moore's electric hoist designers. Each eliminates a possible source of trouble caused by friction... on rope drum (bearing lubricated for life) on trolley assembly, on gear shafts, etc.

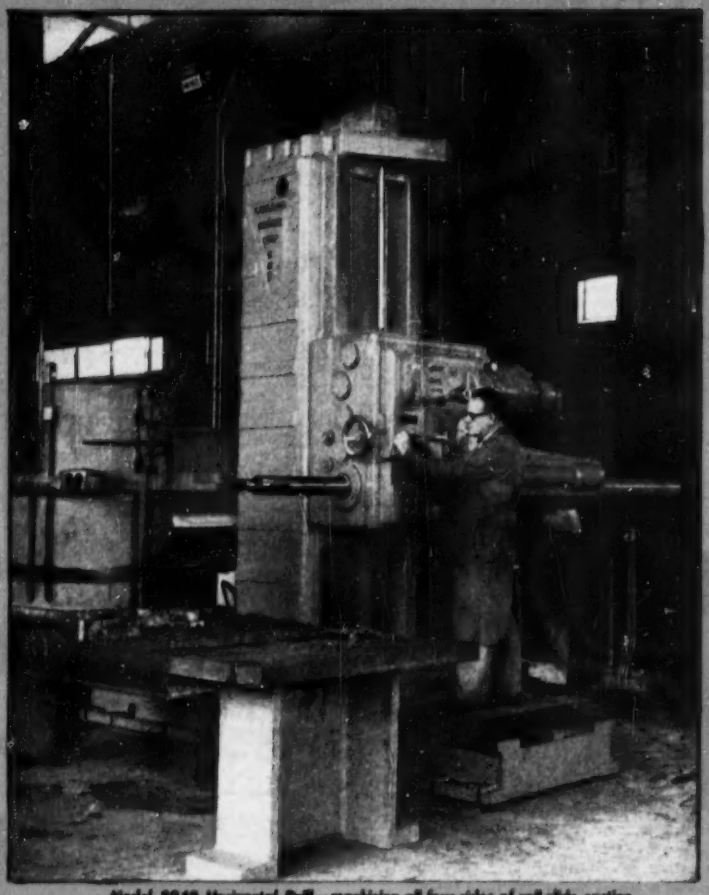
With critical turning points protected, this heavy-duty 1-ton capacity hoist is offered for three-shift lifting *every day in the year.* It lifts a ton, thirty feet a minute. Power is concentrated on lifting, not shared to overcome friction. It's smooth, steady, and efficient. Lubrication becomes a minor detail.

Fafnir is a supplier of Ball Bearings for Manning, Maxwell & Moore hoists and for hundreds of other industrial machines where Ball Bearing advantages improve performance and prolong service-life. The choice of Fafnir Ball Bearings, in case after case, has been influenced by the Fafnir "attitude and aptitude" . . . a way of looking at bearing problems from the designer's viewpoint, an aptitude for supplying the right ball bearing to fit the need. Maybe these attributes can help you solve a bearing problem. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

Kaukauna UNIVERSAL AND HORIZONTAL DRILLING AND TAPPING Machines



Model 3040 Horizontal Drill—machining all four sides of rail slide casting.

CUT COSTS ON SETUP TIME, CRANE TIME, FIXTURING MACHINE HOURS

. . . drive boring fixtures and perform drilling, reaming, boring, counterboring, tapping and spotfacing operations on any size or shape from small production parts to large unwieldy workpieces.

Model 3040 is a sturdy rugged horizontal drilling machine with 10 HP, 15HP or 20HP spindle motor and unusual column rigidity. Maximum productivity assured by use of highest feeds and speeds permissible with modern cutting tools.

Other horizontal models have tilting head or horizontal head and 360° column swivel. Universal models with compound head swivel permit angular, radial and horizontal machining operations with one setup. Machines designed for both portable and stationary applications. Extended runway travel and column height available on all models. Special adaptations to handle your machining problems.

WRITE FOR CATALOG

Model 125-U Universal Drill—drilling, tapping and doweling rocks in place on boring in saddle runway.

Model 125-HR Horizontal Drill—used with revolving table to drill and tap tractor frames.

Model 1030 Horizontal Drill—performing drilling, tapping and boring operations on milling machine column.

Special Model 140-U with extended column, runway, and reach—for drilling Diesel Engine bases and blocks.

KMC

Kaukauna MACHINE CORPORATION

KAUKAUNA, WISCONSIN, U. S. A.

he has accumulated in all the years of application; time will not corrode the skills he has developed. I don't see that the "deserter" will lose any of his skill although he might not be entirely up-to-date in knowledge of new equipment, tools, and methods.

One of the main reasons why the oldtimer is trying to renew his contact is because of the crying need for experienced men. He'd like to put his shoulder to the wheel and contribute his two cent's worth toward defeating an enemy. His loyalty makes him feel like a deserter when he realizes that he could fit into things and contribute his greatest values—skill and experience.

At the present time I am on the bench again after being away for fifteen years, so I speak from experience. I had to make a change and get out into the open—doctor's orders. Some get fed up with the confining work and seek the outside for other reasons. Upon return to work I felt like an inexperienced groom on his honeymoon—strange, timid, and considerably befuddled from lack of know-how. The foreman was an understanding chap and exercised lots of patience until I got into the swing of things. I wasn't at a loss to know what had been going on in industry as I had kept my eyes open whenever I got a chance. My past experience and the skill I had acquired, coupled with a determination to make good, enabled me to overcome what Ed unkindly termed industrial rustiness. Life is a game of give and take—in this case we give the man a chance to prove his metal and invariably we'll take his experience and draw interest on the investment.

Frank Van Horn
Auburn, Calif

•

LAMBS OR GOATS?

Will company dinners and similar entertainment tend to bring workers and management into closer understanding, or will the men feel their after-hours are being invaded?

How FAR CAN company entertainment of the working force go without becoming too paternalistic? A very short distance indeed if one takes all the conflicting factors into consideration. The factors will vary from plant to plant, but after giving the matter of works social relationships years of thought and varied but honest trials in a number of plants, I have to confess that, from observation, neither the boss nor the

CESCO RIGHT... before your Eyes!

WHERE TO BUY IT...

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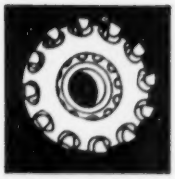
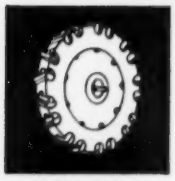
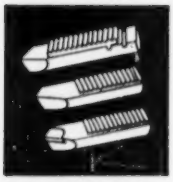
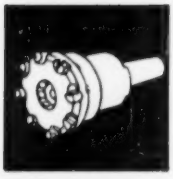
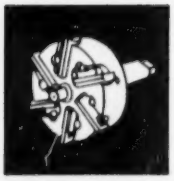
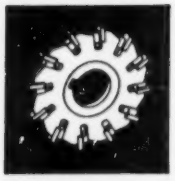
CESCO FOR SAFETY





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2 Serrations are on the front of each blade — the plain back makes full contact with the body.

3 Positive-locking device on blades assures complete rigidity, even on heavy intermittent cuts.

4 Advancing, replacing and sharpening of blades is fast and accurate, keeps down-time at an absolute minimum.

5 Extra rugged blade and body design assures maximum results on modern, high-speed millers.

6 H. S. S., alloy and carbide-tipped blades are available promptly from stock.

7 Lovejoy design is tops for blade interchangeability in practically all cutter styles and sizes.

8 Lovejoy has had 35 years of experience in designing and manufacturing standard and special cutters for the country's leading manufacturers—our background can help *you* get best results from *your* milling operations.

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LOVEJOY
TOOL COMPANY, INC.

worker seems to hanker after each other's company. They never seem to be at ease together, in a social capacity, and the boss usually seems to be the more uneasy of the two. This is not to be wondered at; their environment, education and social atmosphere are so totally different that it is a source of wonder to me that "nights out" with the boss should even give the *impression* of being moderately successful.

In referring to the boss I don't refer to shop bosses who are accustomed to handling shop personnel and who can pass themselves on works social occasions without feeling at any disadvantage. It is the higher executive bosses who have little or no connection with the shop foremen or men that I feel sorriest for at a plant social evening. They feel they ought to circulate around the room and talk to as many people as possible. This is not such a simple matter as it seems and, in fact, calls for a great deal of courage and tact if the workers are to be made to feel at ease and at home, and not that the boss or his good lady are talking down for the occasion.

Years ago as a shop foreman I attended a foremen's dinner to which the big boss was invited. In the course of the evening he rose to make some remarks but seemed to feel that for a foremen's function, he might be expected to lower the sights, so he told us a funny but rather objectionable story which was reecived by the foremen in chilly silence. They very evidently felt it to be beneath their standing and intelligence and entirely out of place, in view of the fact that wives and sweethearts were also present. The big boss took it on the chin and apologized, but he never quite lived down that particular indiscretion. I felt very proud of my fellow foremen that evening. The dignified silence in which the story was received, coupled with the cool, polite interest displayed in the rest of his remarks must have driven home to the boss the measure of his failure to gage the moral and intellectual standard of his listeners. In spite of that unhappy experience my sympathies go out to the college type of big boss who is called on to be hail-fellow-well-met to a company with whom he has so little in common. It is, for some, a distressing position to be placed in and it is not surprising that so few of the big bosses succeed in making a workmanlike job of it, however much they would like to.

In a slightly different connection

NOW— NEMA Type XII

THE ONLY SAFETY SWITCH IN SPECIAL INDUSTRY ENCLOSURE!

CAPTIVE SCREWS
assure tight cover fit
EXTERNAL MOUNTING FEET eliminate need for conventional leaky mounting holes within the enclosure
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provides positive cover seal
WELDED TIGHT ENCLOSURE without knockouts excludes dirt, dust, oil, and splashing coolant

This new heavy duty switch, built to NEMA XII specifications, is "tailor-made" for applications requiring the exclusion of dirt, dust, oil and coolant.

The rugged, visible-blade switch mechanism within the special industry enclosure has all the performance features that have made Square D an overwhelming "first choice" for fifty years.

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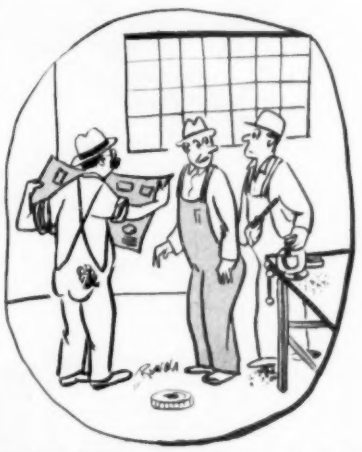
but with a direct bearing on the subject, I, as a new, young foreman in a large concern was called to the manager's room where I found also the managing director, an American, as it happened. The manager introduced me as the new machine shop foreman and the big boss said "Quite," looked me up and down, inclined his head and with an affable smile said, "Thank you." On my way out I felt as if I had been merely an exhibit, but despite this unpromising start I was later to know the big boss as a good sort, if somewhat shy and tongue-tied in unfamiliar company.

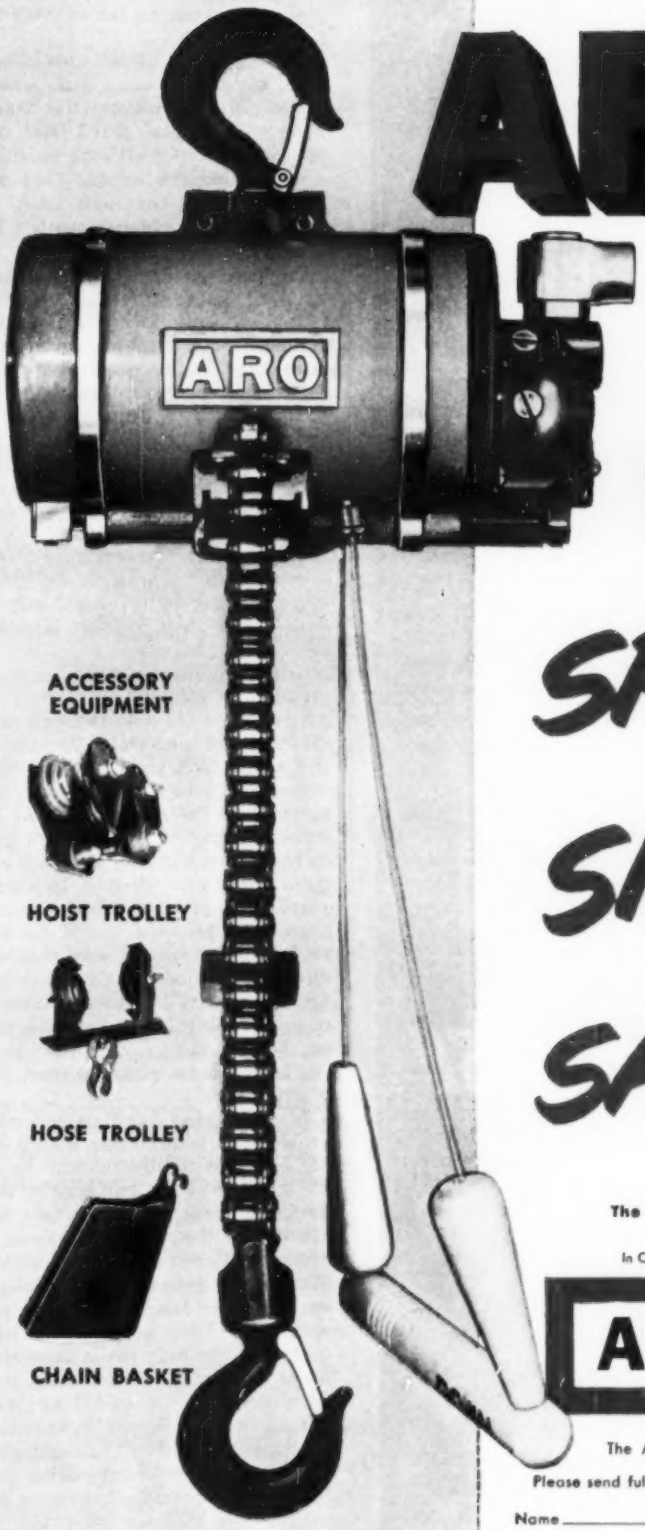
Until we arrive at a classless society, if we ever do, many men will mildly resent the management's social advances. The gulf between them is too great and, possibly, only the closing of that gap could lessen or overcome the men's distrust of friendly advances by the bosses. "Let them come down here and live amongst us," I heard a soap-box orator shout in a poor quarter of the town, and although that particular invitation had nothing to do with friendship, it lingers still in my memory and seems to me to be the very kernel of this problem.

If the man at the tools could afford to live out in the country and run an expensive car and, perhaps, a small boat for holidays, if his wife could afford a small runabout for shopping and a maid or two, and if they could send their boys and girls to expensive schools—in short, if they could be made equal to the bosses, intellectually and financially, with an equal voice in the affairs and policy of the company, then offers of friendship would assume a new meaning to the men, but unfortunately we would then have no



"I don't think I'm going to like working for this guy. He looks like the type of guy who's always telling you what to do."

ARO



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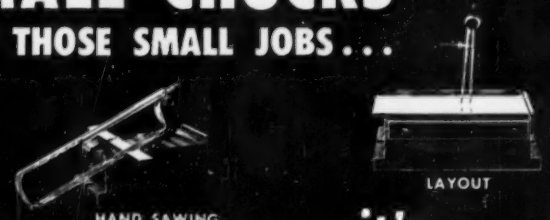

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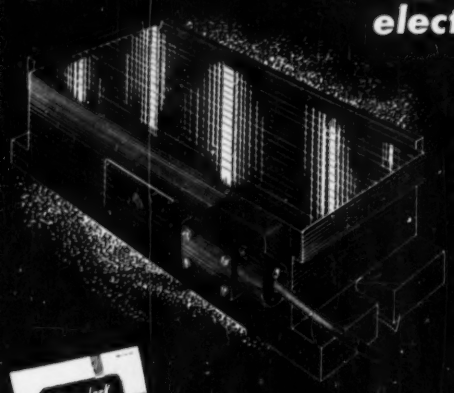

5" x 10"... 6" x 12"... 6" x 18" working surfaces. Ideal for bench work, small machine tools. 22% more holding power . . . moisture proof . . . other advantages of larger Magna-Lock Chucks. Complete with rectifier and switch for operation on A.C. voltage.

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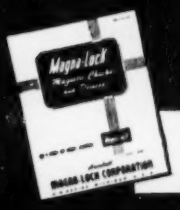

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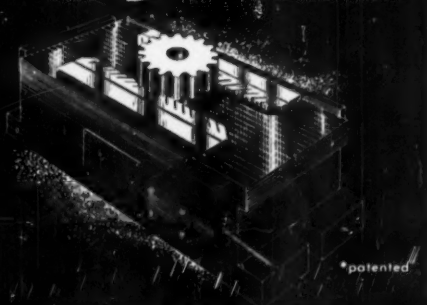
...AND FOR NON-MAGNETIC MATERIALS it's **Magna-Vise***

HOLDS fibre, brass, copper, plastic, others. Increases versatility of your magnetic chucks. Send for facts.



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Magna-Lock is first to increase your machine's productivity

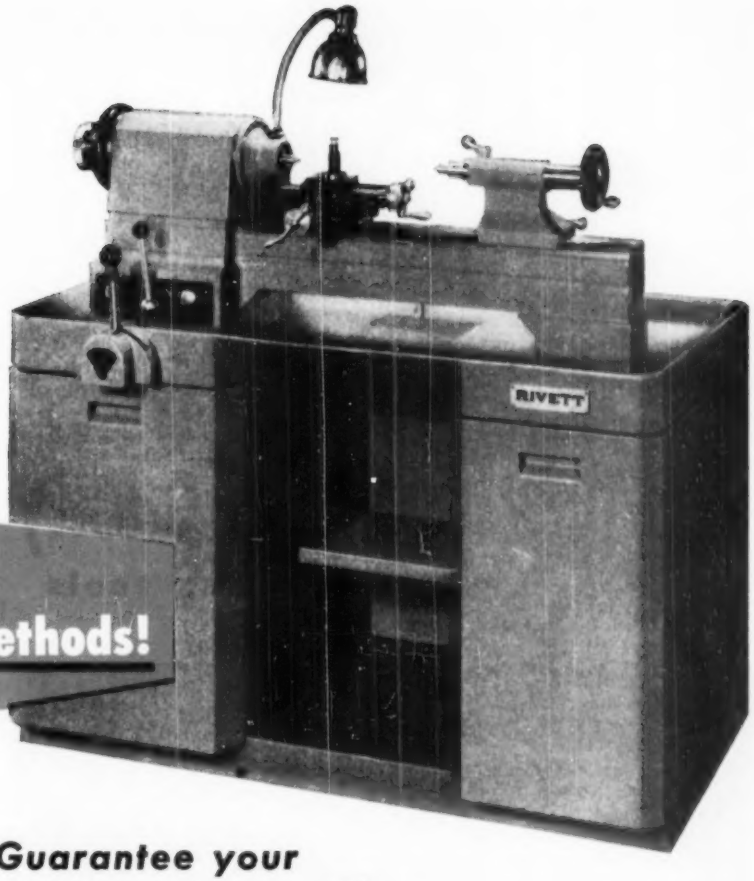
Hanchett **MAGNA-LOCK CORPORATION**
Magnetic Chucks and Devices
BIG RAPIDS, MICHIGAN, U. S. A.

one willing to hew the wood and draw the water, no one to fetch and carry.

The first part of the idea as outlined by Al, is, "just a little scheme to promote harmony in the department," is excellent and I have seen it produce very gratifying results in several different works. That part leaves the big boss out; he is not identified with departments. The whole show would be run by the men, foreman and shop manager, all well known to each other by reason of their location and daily contacts. Such a get-together during long winter nights can and does promote good shop conditions and the company loses nothing by being responsible for the cost, minus, say, an agreed nominal contribution by each one present. The big boss's presence at such functions would not make them any more enjoyable or useful, but if he were a good mixer, at ease with the man at the bench, there is no reason why he should not look in for a bit without formality or ceremony.

The second part of the scheme, the creating of confidence between the men and the old man is much more difficult and uncertain because of the intellectual, social, and financial differences between the normal employer and the normal man at the tools. I am not sure that it is a good thing for the big boss to be on intimate terms with the men. In a large plant he could not possibly get round them all and some would be sure to feel neglected; shop atmosphere would suffer accordingly. Much better to leave the intimacy to those of us whose job it is to handle the men on the job and whose social standing is not so far removed from that of the men's.

In considering this most important problem of what terms should the big boss and the bench-hand be on, we must not close our eyes or ears to facts. The glittering prizes will ever go to the men and women of vision, imagination and leadership. These qualities and characteristics are not to be found in all men and women in like proportion. Great courage alone may win a decoration for a soldier, but much more than great courage is required to create a Ford or Rolls Royce organization. Envy, even jealousy, and a feeling of at least material inferiority, play their part in making it almost a certainty that the men and the big bosses will never become bosom pals. In the interests of progress I doubt if it is desirable they should. The man who climbs up out of the ranks to become a successful employer of



Stop using "CUT and TRY" methods!

Guarantee your finish and size with a

RIVETT 918 Steelway Cabinet Lathe

Snug up to a Rivett 918 and with confidence turn, face or bore to your exacting tolerance—thrill with the knowledge that you are duplicating parts within "tenths".

The speed range and tool rigidity combined with the inherent precision of the 918 assures finish and size—perfect for second operations and toolroom work.

Use a lathe consistent in size with the work to be done—save on the initial expense and continue to save with each piece produced with less effort and without rejection.

FEATURES for more precision work

- **Instant selection of 90 to 3750 R.P.M. cutting speeds with convenient control and dial indication.**
- **Self-aligning slide rest automatically squares itself with line of centers.**
- **Double bevel steel ways, precision ground, provide positive centering action.**
- **Collets, with spacing of bearings doubled, have greater precision and gripping power.**
- **Lever chuck closer may be furnished with "one motion" control for collet, spindle drive and brake.**

Write for bulletin 918SL. Proof of what the 918 will do for you is shown in this 20 page book.

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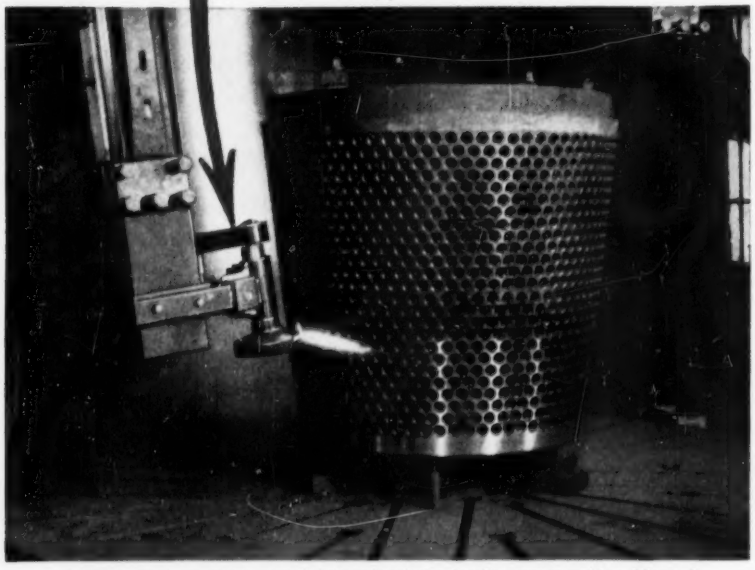
For More Precision Work *RELY ON RIVETT LATHES AND GRINDERS*, The Master Craftsman's Master Tools

DUMORE® tool post grinders

add productive capacity

to your present machine tools



A Dumore tool post grinder provided the only solution for this unusual problem. Mounted on a vertical boring mill, it halved former production time for grinding on the perforated, tapered surface of 43" cast iron strainer cores.

PUT this Dumore grinder on a turret lathe, planer, milling machine, shaper, boring mill or universal grinder. In fact, mounted on any machine you'll get a more versatile tool that will not only machine the workpiece, but finish grind without changing setup — or switching job to another machine. What's more, it delivers precision work to .0001" accuracy.

Production men say the Dumore grinder is the busiest tool in the shop. They like its flexibility . . . the high quality work it turns out. These grinders are ideal, too, for tool room and maintenance work.

Dumore tool post grinders often pay for themselves on the first job. They offer an amazing potential for reducing labor and handling costs... increasing machine capacity . . . improving product quality.

Ask your industrial distributor to show you how Dumore tool post grinders can cut costs for you, or write

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men is, as a rule, no more popular with the men than he who succeeded to the family business and fortune. On the whole, the big boss should remain the big boss and not go philandering after spurious or doubtful popularity; to my mind, he is one of the cobblers who should stick to his last.

M Donald
Lanarkshire, Scotland

•

PRIVACY, PLEASE

Does working in partitioned enclosures tend to increase efficiency? Will the men resent being stalled off and separated from their fellow-workers? How does semi-privacy affect concentration — favorably or unfavorably?

THE DISCUSSION regarding privacy in the shop brings up an experience in England many years ago—nearly forty in fact. On account of the lapse of time it may be questioned as to whether the same condition exists today. I assume it does not.

I was visiting a well-known manufacturing plant where the works manager was an American who had been brought over to introduce some of our methods into an old shop building very special machinery. (I found several shops where this same practice had been followed. Since then I am sure that the British engineer needs no assistance of this kind. For we must not forget that the jet-propelled plane is a British device.) In the division where new devices were developed there was no attempt at privacy for the man working on them. The manager explained that he had not found it necessary, as each man seemed completely tied up with his own job and not at all curious as to what his next-door neighbor was doing. In this country at that time development work was carried on in small rooms or at least with partitions on the benches. There he had not found it necessary. I doubt very much if such a condition prevails today.

If privacy is being considered to increase the production by preventing intershop conversation rather than for keeping new and special work from prying eyes, it does not seem in keeping with the spirit of shop comradeship and cooperation. A good incentive system is one of the best means of preventing time being lost unnecessarily in any shop. A shop that was one hundred percent efficient would be beyond the pale of human frailties.

Fred H Colvin
Point Pleasant, NJ

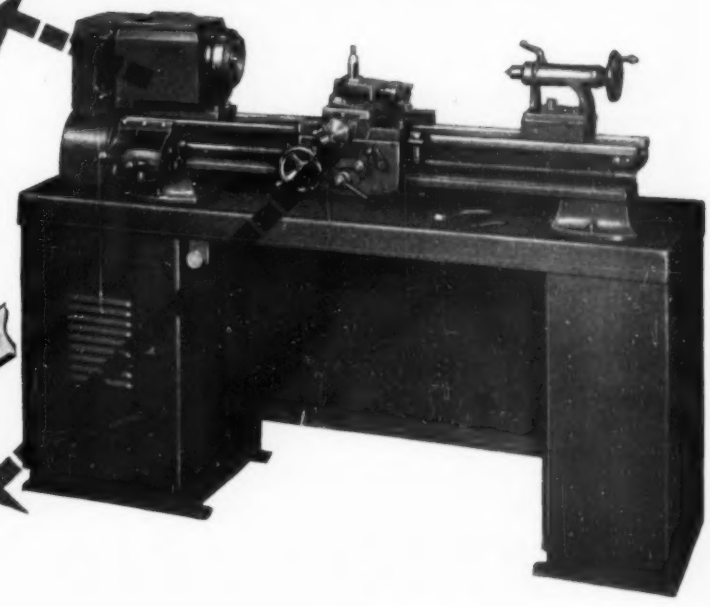
Close-Up Look Tells Why... THE NEW 12" SWING LOGAN LATHE

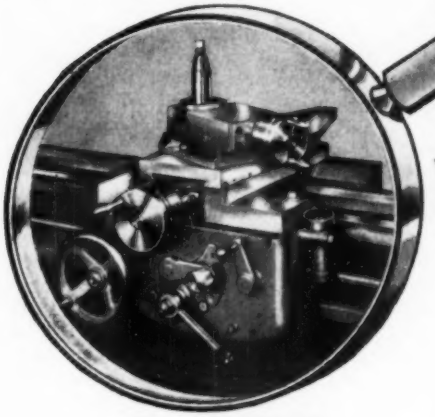
DELIVERS PLUS PERFORMANCE

The HEADSTOCK Is Massive, Rigid, Convenient

Massively proportioned spindle means extreme rigidity on heavy cuts. Oversize ball bearing mounting assures sustained spindle accuracy. Outboard V-belt drive transmits power with maximum efficiency and simplifies belt changing or adjustment. Accessible gear-shift knobs add to operating convenience and safety.

For Production, Maintenance, Tool Room or School Shop





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Simple, lever-operated disc type clutch gives new operating convenience. Easily read, widely separated graduations on the extra large dials permit accurate readings. Precision ground top surfaces on cross slide and saddle permit mounting fixtures and use of magnetic indicators. Extra wide and long bearing surfaces on cross feed slide. Heavy, massive compound for rigidity. Apron operates in bath of oil.

The closer you inspect this new 12" swing Logan Lathe, the *better* it looks. The advanced design of individual parts, and the precision construction throughout become more evident. You will like the size, too. Its 35" center distance, 1⅜" spindle hole, 1" collet capacity, and rugged, massive proportions mean extra capacity, stability and power. Keep this newest Logan in mind as you make plans for your production line, tool room, shop, or student training program. The quality you see in your close-up look will serve you well through extra years.

SEE IT AT YOUR LOGAN LATHE DEALER'S, OR

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LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

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Brief Specifications of Logan 12" Lathes

Swing over bed and saddle wings, 12"... Center Distances, 23" and 35"... Turret Lathes Models have 43" bed length... 1⅜" spindle hole ... 1" collet capacity ... 16 spindle speeds, 38 to 1260 rpm.

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Palletable or palatable—it makes no difference whether you're handling hard goods or soft drinks, Towmotor loads, unloads, stacks, stores, delivers, and ships more kinds of materials in more ways, more quickly, more economically, more easily. Towmotor makes your operations look better literally and figuratively.

You'll want Towmotor, with new Power Steering that increases driver stamina by reducing steering effort 80% . . . with the new "Cushioned Power" Diesels that deliver more power and save fuel costs . . . and with the many other Towmotor features that make Towmotor the best buy for your boss and best by far for you! Send today for free booklet, "What Makes It Tick?" TOWMOTOR CORPORATION, Div. 5609, 1226 East 152nd Street, Cleveland 10, Ohio.

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FORK LIFT TRUCKS and TRACTORS
SINCE 1919
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JUNGLE LAW

How much responsibility has a foreman toward his company in the matter of lining up and training a successor, particularly if he is considering leaving the firm eventually?

PREPARING FOR contingencies that may arise in the future, whether it be a stockpile of repair parts, reserve machinery ready to be put in operation, or personnel, is certainly good business.

There seems to be no question about the advisability of having substitute parts to be installed in times of emergency, but when it comes to preparing substitutes for foremen there seems to be a question in some minds. It is incumbent on each employee to do what he can to maintain the plant at its highest efficiency. Efficiency to some people is a word that goes against the grain; they look upon it as being something beneficial only to the employer, designed to hold the employee down. The truth is that the more efficient the production, the more gain to all. Anything that will tend to produce a superior product, higher production at less cost, will eventuate in increased benefits to the working force. Whether it be the plant superintendent or the lowly sweeper, it makes no difference; each should be vigilant to anything that might be of benefit to the plant as a whole.

Strange as it may seem, a man who has the interest of his department at heart should look into the future and prepare the way for a successor in the event of his sudden demise, illness, or leaving to take on another job. Some are inclined to feel that this is nothing short of economic suicide. They would rather have their individual loss felt even though it proved very costly to the employer and, incidentally, to the remainder of the working force who, naturally, would suffer as a consequence.

In appointing a successor, or breaking in a dependable person to take over in an emergency, there is a question as to whether it is the right thing to do. To you who doubt the wisdom of adequate preparation, just console yourself with the thought that you are acting with objective unselfishness and are motivated by the necessity of your replacement being the best.

Any man who prides himself in his ability as a foreman doesn't have any fear that breaking in a substitute will eventuate in his own downfall by means of a double-cross.

Here's one you'll want to bite on! It's Formbrite

Upper lure is Formbrite. Lower one is made of ANACONDA Fancy Pattern Embossed Brass.

FISH find this particular line of brass spinners so attractive that fishermen's demands have built annual sales of the Aeroplane Tackle Manufacturing Company of Denver to more than two million lures of all types.

The high finish on the spinner is part of the secret. While the cost of producing this is of no interest to the fish, it is to the manufacturer. Recently all brass orders were changed to Formbrite®, the superior ANACONDA Drawing Brass that has enabled this firm to cut polishing costs over 25%, and on several stamped products to produce the required finish by tumbling only prior to lacquering or plating.

Formbrite, with its superfine grain, provides a surface far superior to ordinary drawing brass. It is stronger, harder, more scratch-resistant than ordinary brass, yet retains remarkable ductility for forming and drawing. It's a premium product at a non-premium price. If these features lure you, we should like to show you how this better brass can cut your product's finishing costs. Or write for Publication B-39 to *The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.*

Thirty-five years ago a fisherman, disgusted with his luck, cut up an old brass bait box to make himself a spinner resembling an old-time airplane propeller. Both fish and fisherman liked it so much, he started what is now a big and thriving business. ®Reg. U.S. Pat. Off. 5892

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An ANACONDA® product made by The American Brass Company

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FOR EXTREME
ACCURACY
AND BEST
PERFORMANCE

The Big Sturdy
JOHNSON 10" x 18"
BAND SAW Is Machined
to the Closest Standards

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WRITE FOR DETAILS OR
SEE YOUR JOHNSON DEALER

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

It's the man who keeps secret his job, guarding it with selfish fear of someone prying him loose, who is blind to the obligation he has to the man whose interests he pledged himself to maintain.

The successful executive is the one who has arranged his work so that it will carry on after he stepped out. In this day of speed one cannot be sure whether he will be on the job the next day or not. Adverse circumstances, necessitating his being absent from the job for any length of time, present themselves increasingly in this merry-go-round of heart ailments, high blood pressure, and domestic difficulties too numerous to mention, making it necessary for someone to take over at a moment's notice.

The employer has his welfare to be considered and everything should be done to have the shop run with all possible smoothness and efficiency. The foreman likewise has interests and inalienable rights as a free man. His right to be on the lookout for another position is just as necessary as is the employer's to keep his eye open for a better man to take over. No employer has any right to expect a man to disregard any offer of another job even though it comes from one of his chief competitors. Free enterprise is a fighting enterprise in which each man is on the lookout for himself. Like any other fight, good sportsmanship should be considered and pays off in the long run.

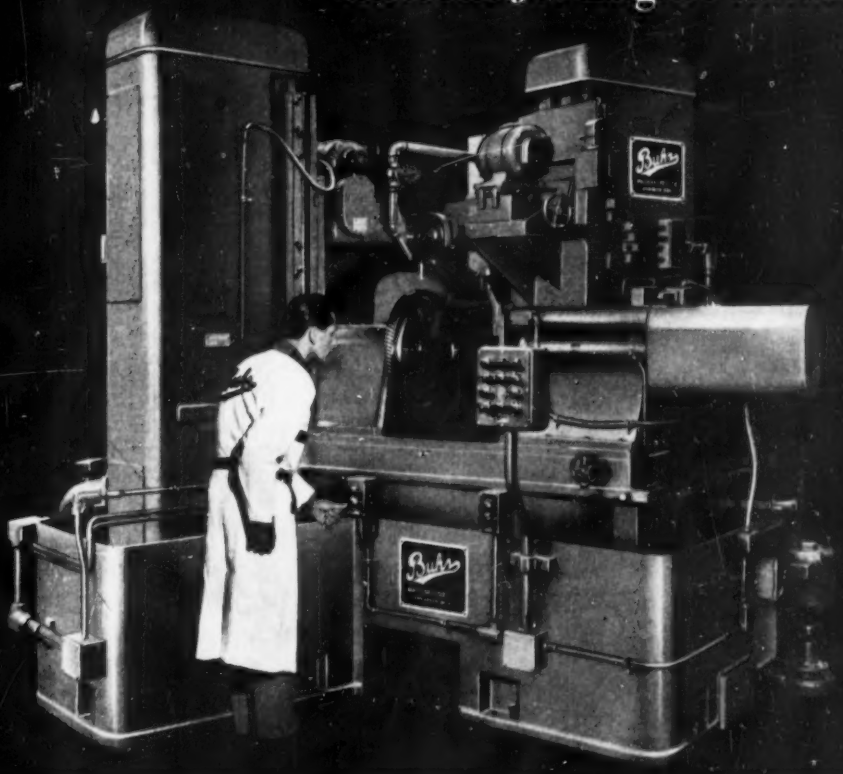
J Homewood
Tujunga, Calif

WHY SHOULD IT be called skullduggery if a man is trying to get a better job? I think everybody has a right to advance as fast as he can even if that advance takes place with a competitor. This might be prevented by

"Do I get a cigar or something if I hit it?"

Buhr SPECIAL...

Mills both ends of 57 up to 103 slots in 16 different Jet Engine Rotors



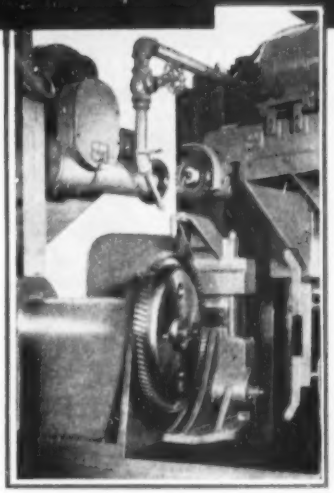
Automatic 2-spindle milling machine, arranged with automatic index for milling both ends of dove-tailed slots.

Equipped with hardened and ground laminated tool-steel ways.

Hydraulic and electrical installations to J.I.C. standards.

Automatic index unit arranged for milling the various stages from 57 up to 103 slots.

Once machine is set up for any one part, operation is fully automatic, including stop when part is finished.



BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Buhr **MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY**

STANDARD STOCK SIZE JOHNSON sleeve BEARINGS FROM YOUR LOCAL
Johnson Distributor
Over 900 sizes
JOHNSON GP BEARINGS
These GP (General Purpose) Cast Bronze Bearings run from ¼" to 4½" ID, 213 ID-OD combinations, up to 21 lengths of a given size.
Over 200 sizes
JOHNSON LEDALOYL BEARINGS
Powder Metallurgy Ledaloyl Self Lubricating bearings in plain, flanged and self-aligning types.
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Electric Motor EM Bearings are available for all popular motors. Equal to or better than original bearings.
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JOHNSON UNIVERSAL BRONZE BARS
Cored, solid and hexagon bars, 13 inches long. All except hexagon bars completely machined ID, OD and ends.
Over 400 sizes
JOHNSON JB BEARINGS
Sleeve-Type
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BABBITT METAL
Tin base and lead-base Babbitt in 7 pound bars.
Over 200 sizes
JOHNSON GRAPHITED BEARINGS
Cast Bronze Graphited Bearings provide 40 to 45% graphite contact with shaft, for applications difficult to lubricate, or where ordinary lubricants may damage goods in process.
Write for catalog
JOHNSON BRONZE COMPANY • • • 515 South Mill St., New Castle, Pa.

informing a worthy man that he's on the promotion list and that he might get a higher position if he sticks to his job the way he's done in the past.

But do the employers tell their men such encouraging things? I doubt it, because this would not be consistent with the jungle law at all. But survival of the fittest is probably the most practiced rule employed in selecting men for any position or job.

I agree with Al when he says that he is not so sure of a really good promotion any time in the next few years. If there is no opening there will be no promotion, and then Al would have waited in vain; also if there is an opening somebody else might be selected. So I don't blame him for trying to advance on his own merit when his employer has not even hinted that he was about to promote him.

It's very well to see to it that the department is handed over in better condition then he received it, but as to a man suggesting his own replacement, I doubt if it is practiced anywhere. There might be a few exceptions, but this only confirms the rule. If the superintendent does ask him, then, of course, he should tell him. But this I don't think he'll do.

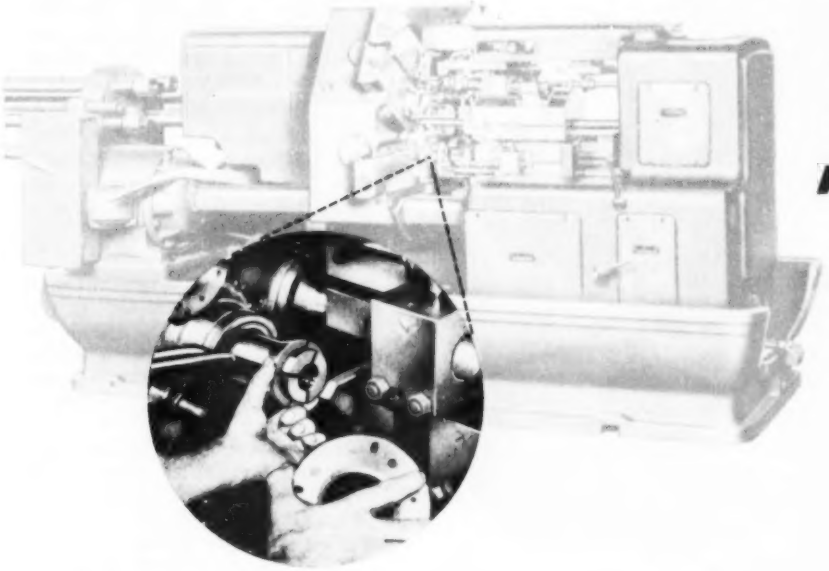
It's up to management to have a lieutenant lined up for emergencies. Al is right when he says that if he started himself to suggest somebody now, it might give his employer the idea he was looking for another job, and that certainly would spoil his chances of being promoted.

Sometimes when a man gives notice he is leaving within a month he might be asked to leave immediately.

If management in Ed's and Al's place is as human as Ed says, Al can trust it under all conditions. I don't understand why they have left him in doubt as to his own opportunities with the firm. Al would probably not have the feeling that his employer neglected him if this were true. It would be foolish for him to join another company if his present employer was paving his way for the future.

Al has a perfect right to advance, feeling that his conscience was clear. I would also worry less about my conscience than I would about getting somewhere myself. The only thing I would look out for would be not to step on somebody else. If a company does not give an ambitious man a chance, it's probably because they don't care about him; he might as well leave and join another em-

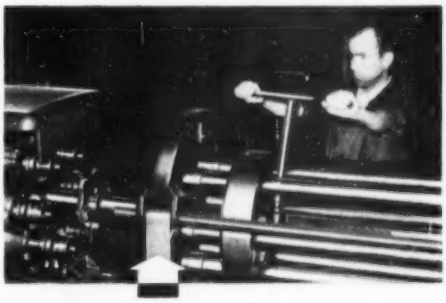
GREENLEE *Automatics*

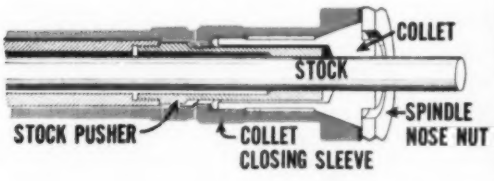


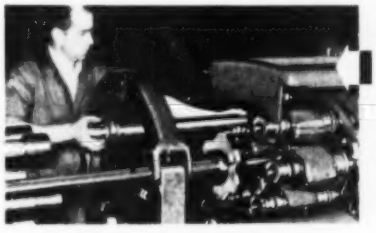
COLLET AND FEED FINGER ARRANGEMENT

REDUCES SET-UP TIME

All six collets and feed fingers can be quickly and easily changed without indexing the spindle carrier. The collets are changed by simply removing the spindle nose nut. Greenlee collets are operated, as illustrated in the drawing, by the action of a sliding sleeve over the taper of the collet. The nose nut holds the collet in a fixed position inside the spindle, thus eliminating any endwise movement. As a result, none is transmitted to the stock, and this provides for accurate stock feed-out.







CHANGING PUSHER TUBES

A few turns of a wrench moves the head of the stock-reel backward to afford the operator plenty of room to change the stock pusher tube assemblies, after releasing and indexing retainer plate.

PRODUCTION MACHINERY

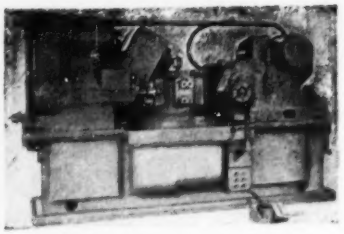
GREENLEE

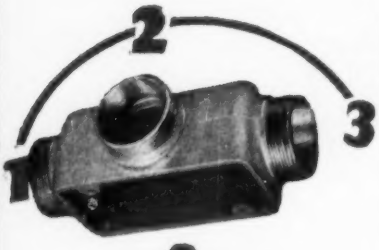
Write for FREE Literature

GREENLEE BROS. & COMPANY, 1729 MASON AVE., ROCKFORD, ILL.

MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Here's what is meant by "1-2-3" in the GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINE





The outstanding advantage of this machine is ability to handle operations on one, two or three ends of a piece simultaneously or in sequence, *without changing set-up* or rehandling. It is the only standard machine that will do this.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this machine.

For complete details ask for illustrated bulletin. Send samples of your work for time and cost estimates.

GOSS & DE LEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW

MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

ployer where his service is more appreciated.

If Al owes the firm something after many years of work, I think the employer owes Al much more; certainly Reynolds would not have kept him if he had not been profitable to him. If he has done a better job in the machine shop than anyone else he has nothing to regret.

If a company is asking loyalty of its foremen to the point that they make arrangements for their successors, then I think they should also treat them so well that they rarely take the step of leaving.

A E Fristedt

Stockholm-Bromma, Sweden

•

BACKFIRIN' DISCIPLINE

What is the best way of impressing workers with serious consequences of an important mistake? Is discharging such a worker always the answer, or suspension for a limited period? Sometimes other factors should be taken into consideration . . .

WHEN A MAN scraps a valuable piece of work or breaks an expensive piece of equipment, it is a natural instinct to wreak vengeance upon him. One way to do this is to sack him. However, as we are civilized men, it is not advisable to give way to our natural instincts and give judgment on the basis of raw emotion. It is much better to hold an investigation into the causes of the accident, taking into consideration the previous record of the culprit, and to try and prevent miscarriages of justice.

The investigation will probably shift the responsibility for it from the shoulders of the machine operator and on to those of some person who should have foreseen the possibilities of disaster and taken steps to prevent it happening.

The choice of a press to illustrate the case is not an apt one. In the first place, men who feed presses are not expected to be capable of exercising a high degree of skill. If an accident happens to an automatic piece of equipment, such as a press tool, the culprit is the tool designer and he should be reprimanded for not designing adequate safeguards or fool-proofing into the tool. Elementary teaching of tool design stresses the need for fool-proofing: to neglect its provision shows a lack of knowledge on the part of the designer.

When a skilled machinist makes a mistake, nine cases out of ten show that it is not his fault. By far the greater proportion of errors arise

from faulty and obscure drawings which do not convey all the information that the job requires. This defect in turn is often due to the fallacy that drawing-office time is worth saving by providing the minimum amount of information.

I can always recall the disastrous mistake I made when operating an engine lathe on which I had to machine some shafts made from high quality and scarce steel. I scrapped the whole batch of work because I had not left any material for machining an integral key which was to be machined later on one of the diameters. I worked to the shaft diameter instead of a diameter which would include the top of the key. Investigation of the drawing showed that the key was not clearly shown. It would have been perfectly clear if the draftsmen had drawn a small section through it making it obvious that the key was integral with the shaft; the draftsman got his drawing done quicker, but the mistake in machining cost 100 times the money he had saved.

Prior to making this mistake, I had had a clear run of two years working on the lathe without scrapping a single piece of work. There was not much point in throwing me out of the plant. It did not solve anything; rather it would give rise to other problems for the management. I would have to be replaced by another man who would have to be indoctrinated into the shop routine and the newcomer would be an unknown quantity who would have to be watched to find out his capabilities.

Generally, the skilled operator is much improved by making a mistake occasionally. If he is a conscientious type, a mistake of large proportions will generally make him

"I never could take orders in the Army, so perhaps I had better start at the top."

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Bunting Bronze Sleeve Bearings can be tailor-made to your design at moderate cost, even in small quantities. Or, they are available in over a thousand standard sizes from the stocks of hundreds of Bunting Distributors—at least one of them near you.

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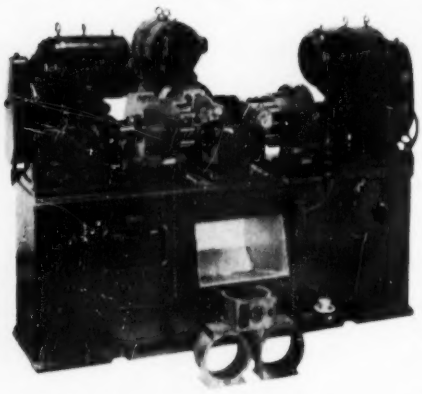

DRILLS 32 HOLES IN VALVE BODY AT RATE OF 240 PARTS PER HOUR

Bradford 3-Unit, 32 Spindle Cam Feed Drilling Machine boosted output sensationally in plant of a large valve manufacturer. Machine is completely electrically operated and interlocked.

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Bradford can supply you with either a single unit or a completely automatic, high-production machine for performing any particular set of production operations such as drilling, tapping, reaming, threading, spot facing, counterboring, etc. One-half to 5 h.p. units. Let Bradford engineers assist in solving your drilling and tapping problems. Write, giving details of your job requirements.

THE BRADFORD MACHINE TOOL COMPANY
664 EVANS ST., CINCINNATI 14, OHIO

much more careful in the future and he will be all the better for it.

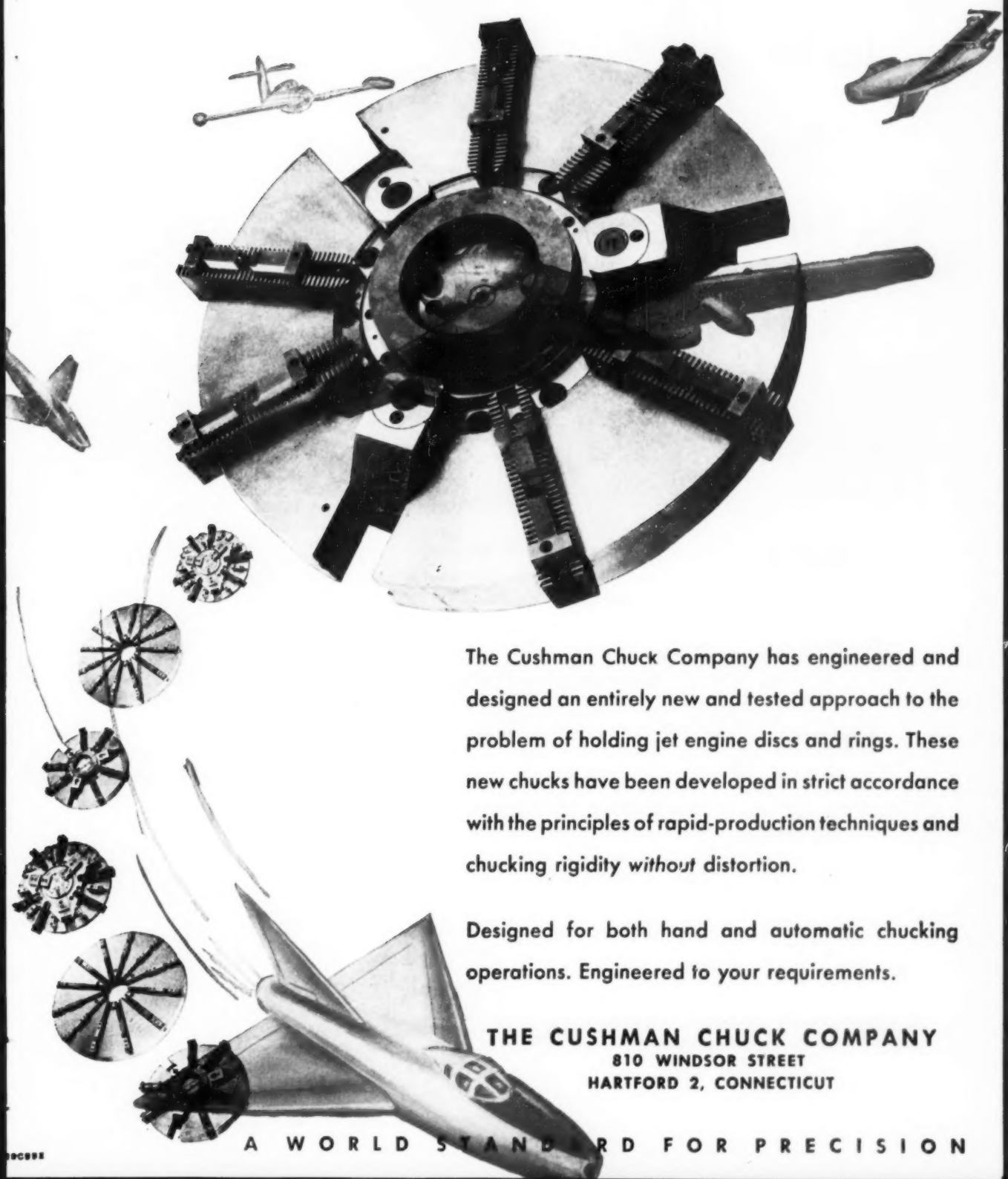
There can be no question that scrap is one of the normal hazards of any manufacturing organization and it is usual to make as much as 5% allowance on batches of components. On one-off jobs scrap allowance is naturally impossible to provide, but the possibilities of scrap should always be borne in mind and the provision of replacement material should be allowed for.

There are operators, who drift from one job to another because they have a natural bent for turning out scrap. There is not much that can be done with such men; they can be fired on making their first mistake or they can be down-graded to some job which is relatively fool-proof. When labor supply is tight, it is advisable to hang on to the fumbling workman because there must be some niche into which he can be fitted. No firm likes to take on the job of reforming the poor worker, but given the right shop atmosphere, bunglers can often be converted to good men. Their past troubles may have been due to nerves which caused them to stagger from one crisis to another. If a high percentage of scrapped work is a common feature of a machine shop, it is advisable for some executive to try and find out the cause of the trouble. There may be a shortage of small tools, the drawings may be bad, the foreman may practice favoritism, the lighting may be poor, or the shop temperature too low in the winter.

Threats of firing for scrapping work are no good. Precise work cannot be done by the skilled men if the threat of terrible retribution is dangled over his head. I know of one machine shop in the London area which warns all new operators that the first job that they scrap will result in their dismissal. The labor turnover of this firm is a complete one—every year sees a completely new operating force struggling to work to ridiculously fine limits with inadequate tools. This firm gets away with this short-sighted policy owing to the fact that they are not a competitive organization. The men cannot fail to scrap work when operating in an atmosphere of tension.

Suspension of a man for one week works only in the case of apprentices who are bound to a firm by some form of agreement. A loss of wages will generally teach them a lesson and make them more careful in future. Suspending a skilled machinist may give him a chance to get himself a better job with some other organization having easier working

Jet Engines create *chucking problems*



The Cushman Chuck Company has engineered and designed an entirely new and tested approach to the problem of holding jet engine discs and rings. These new chucks have been developed in strict accordance with the principles of rapid-production techniques and chucking rigidity *without* distortion.

Designed for both hand and automatic chucking operations. Engineered to your requirements.

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A WORLD STANDARD FOR PRECISION

Here's Why

Last Year

More

Press Buyers

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• Front view WARCO welded steel frame OBI press.

• Front view WARCO cast steel frame OBI press.

• Rear view WARCO welded steel frame OBI press, showing popular WARCO pneumatic friction clutch and brake unit.

Warco®

O.B.I.

Presses

Than ever

Before

The Warco Open Back Inclinable Press Line is designed and built from the frame out to give maximum performance with minimum maintenance.

The slide operates in long hand scraped gibways. The main bearings and crank-pin bearings are provided with heavy walled renewable bronze bushings. The crankshaft is of one piece heat-treated and normalized steel forging. Bearings are drilled and tapped and supplied with either Alemite fittings or piped Alemite system. All Warco O.B.I. Presses are supplied with Warco's popular pneumatic clutch and brake units.

Many other quality features go to help Warco O.B.I. Presses constantly gain greater acceptance with leading press users. It will pay you, too, to look over the Warco line before buying new presses.

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

Federal® WELDERS

Warco® PRESSES

conditions and the employer will be the one to suffer.

Most scrap and accidents to machines are due to a combination of factors, and it is only by investigation of the causes that the blame can be fixed. Finding the culprit is not the answer to the problem—we are not looking for criminals; rather are we trying to find reasons so that we can make constructive provision for avoiding recurrent shop crises.

Clifford T Bower

London, England

BACKFIRIN' DISCIPLINE

WATKINS is one of thousands who suffer as a consequence of someone's error in judgment. He is the goat for one or more lame-brains who, through lack of foresight or common sense, cut too close on the estimate of time to do a job.

Watkins was working under pressure to get the job out and as a consequence made a slip which was very costly to the firm. In situations involving an intricate tool or complicated piece of machinery there is always the possibility of complications arising before the job is shipped—especially so when time is running short and everybody concerned is keyed up to a high pitch. The worker, knowing that there is a deadline to be met, usually works under an unnatural tension and is apt, through his overzealousness to get the job on its way, to make a slip-up which sometimes results calamitously — as was the case when he ruined the die.

When a man has been on a job for 15 years, and has proven himself to be a reliable worker, as was the case with our old unfortunate, and through the rush and bustle of an urgent job blows up at a critical moment, I can see no justice in penalizing him with discharge or layoff

"Listen, Mac, I don't come in the front office and tell you how to push a pencil, do I?"

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precision performance

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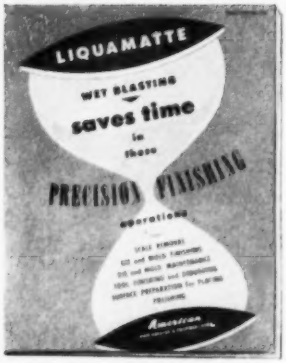
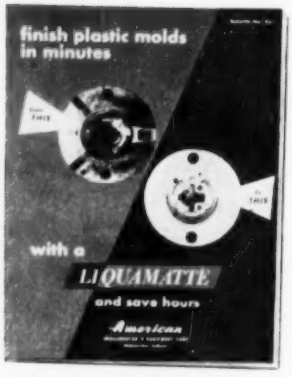
BAY STATE TAP & DIE COMPANY · · MANSFIELD, MASS.

how to cut precision finishing costs



Save Time on Tools, Dies, Molds.
Bulletin 43

Save Time on Glass Molds
Bulletin 53



Save Time on Plastic Molds.
Bulletin 63

The bulletins illustrated above show how tools, dies, molds, engine parts, etc. requiring 1 to 6 hours to finish by hand methods are now finished in from 30 seconds to 10 minutes in a Liquamatte Wet Blasting machine. They explain how manual operations are practically eliminated as dies, molds and cutting tools are cleaned and/or finished to tolerances of .0001".

Take the first step towards reducing your finishing costs and *send for one or more of these bulletins today.*

American WHEELABRATOR & EQUIPMENT CORP.

317 S. Byrkit St. Mishawaka, Indiana

LIQUAMATTE WET BLASTING

just so the foreman can save his own hide. Under normal conditions the accident would not have occurred because the men would have been in physical and mental balance, but when one is working under stress you cannot depend on anything—especially muscular coordination.

I've found myself keyed up high as a kite when working on rush jobs, especially where the boss would show up at short intervals to ask if we were going to make it on time. There are people who are inured to such irregularities and are able to function normally under abnormal conditions, but they are few and far between.

As far as pinning the responsibility on anybody for such as happened to Watkins, all I can say is that it was just one of those things that happens in the course of business. We can honestly say that the real responsibility lies in the persons who arranged to have the die shipped at a certain time, and not on the worker who did his very best to make it perfect. We have all been subjected to unusual pressure at one time or another and our reactions have been such as to cause us to lose control of something—whether it was our temper, reasoning power, or muscular coordination. So why try to pin the responsibility on the one directly the cause of the accident—the one who has been a trusted employee for so many years?

If the customer is such as to refuse to overlook an accident—and an accident it undoubtedly was in every sense of the word—and refuses to recognize it as such and grant an extension of time of delivery, chalk it up to experience and consider yourself lucky you're getting rid of such a customer.

There are a certain amount of risks any company takes in production, delivery dates, and untold other things in the course of the day's business. Business is like that in this high-geared era of ours. Business cannot expect to maintain an infallible schedule, as hard as it may strive to do so, any more than can a railroad. Although there may not be a spike placed on the rails with evil intent, there are situations that could arise where a wreck is inevitable. Likewise with business; wrecks occur in production not because of deliberate sabotage but because of unforseen situations—failure of material, machinery breakdown, tool failure, and last but not the least, the human failure caused by high pressure usually resulting in misjudgment.

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Backed right here in the U.S. by skilled technicians, factory service and guarantee, and spare parts readily available from every Hirschmann Branch.

Typical as to precision and as to fame of trade name. Tornos R10 Swiss Automatic Screw Machine.

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DIE SETS
DIE SINKERS
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GEAR HOBBING MACHINES
GRINDERS
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Labor was this plant's big location problem...

A manufacturer of heavy machinery wanted to locate a new plant in the northeast, close to his suppliers and industrial customers. He required a supply of labor large enough, and with sufficiently varied skills, to get into production rapidly. Foundry men, machinists, toolmakers and designing engineers were especially needed. He got the current information needed to evaluate labor at several desirable sites, quickly and confidentially, from the Industrial Location Service of the State of New York.

What's yours?

No matter what your location problems may be, the Industrial Location Service of the State of New York will be glad to get you, confidentially and without obligation, the information you need to solve them.

YOU CAN GET AUTHORITATIVE DATA ON:

Raw Materials: Cost and availability of all materials and supplies you may need.

Transportation: Availability of facilities, cost of assembling materials and distributing finished product between any given points.

Markets: Industrial and consumer market data.

Labor: Availability, skills and rates.

Power and Fuel: Character and cost at any point.

Available Buildings: Types, condition, facilities and terms. Confidential.

Sites: Availability, size, character, installed services; photos and maps. Confidential.

Community Services: A complete report on the facilities and attitudes of any community.

Laws and Regulations: Full data on laws or regulations applying to any particular form of enterprise.

FREE BROCHURE AND MAP. Send for "Industrial Location Services," a full description of the valuable, detailed plant location information New York State will obtain for you. 1953 large-scale physical map of the state and adjacent areas, showing elevations, transportation systems, watersheds, etc. will also be sent. Write New York State Department of Commerce, Room 810, 112 State Street, Albany 7, New York.

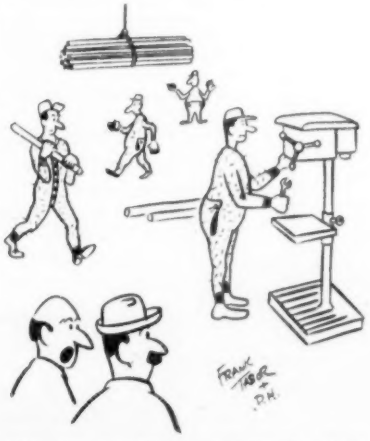
Industrial Location Service of
New York State

"WE DON'T SELL SITES—WE MATCH NEEDS"

Were you, as an employer, to say to your worker, "Look here, Watkins, this is an important job and we want no slip-up. A lot of future business depends on this job, so take your time and see that the job is done right—but try, if you can, to get it out in your best time," your chance of getting the job through intact is far better than were you to stand over the man and constantly urge him on so that the Slaphappy Manufacturing Company'll be happy. Ed's claim that Watkins' error would create a wave of carelessness among the other employees is mere bunk. No man wants to damage any job unless he is a mentally trained destroyer bent on wrecking our form of economy.

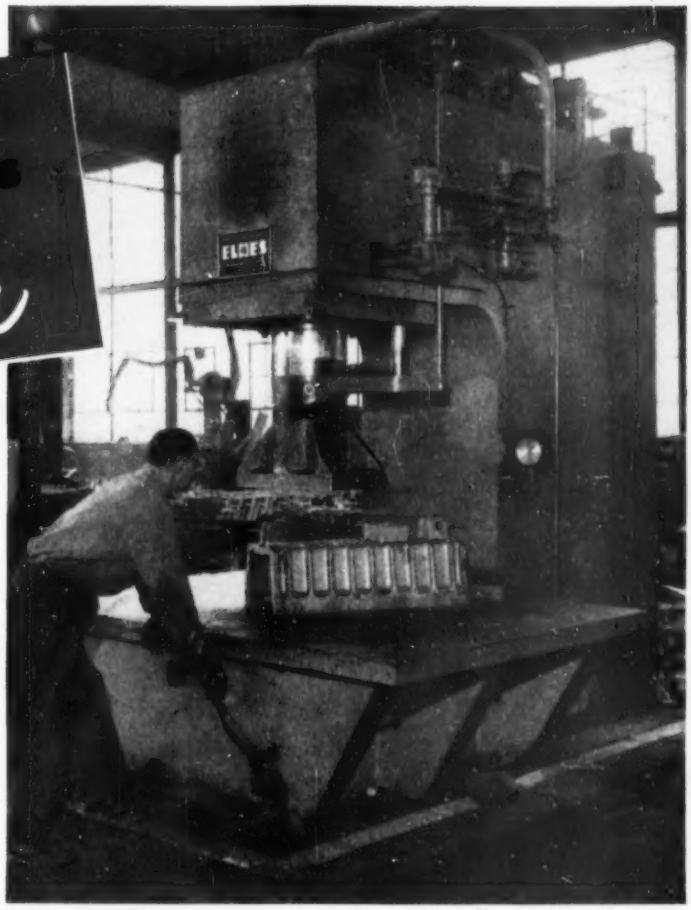
As far as a corrective reprimand is concerned, I would not let the man know that I, as the boss, was something short of a jackass by losing my sense of balance in the form of unruly temper. What good is there to be accomplished by getting sore? Let's face the facts and strive to benefit by our mistakes. I'm certain that Watkins has suffered enough by his error—if we can consider it such owing to the stress under which the man labored—and will be a better man as a consequence. Don't pull any kid stuff by sending him home thinking that he will try to mend his ways; he has no ways to mend because you, as the employer, are responsible for permitting the man to work under such conditions.

Many a good man has been ruined economically and spiritually by some such assinine form of reprisal on the foreman's part. You can prove your worthiness of handling a business by being just, taking the bitter with the sweet, and conducting yourself like a human being worthy of dealing with human beings. No loss



"You have no idea how strong the local union is!"

Straightens Steel Castings 40% Faster



Look to

Elmes

for press performance at its best!

Elmes Open-Side Press in plant of Maynard Electric Steel Casting Company, Milwaukee, producers of electric furnace steel castings.

The Elmes 250-Ton Hydraulic Open-Side Press shown in photograph is used for straightening castings ranging from 50 to 4000 lbs. The Maynard Electric Steel Casting Company reports that this Elmes Press is 40% speedier than the presses previously used, and also is more accessible and more economical to operate.

This is but one of many types of hydraulic metal-working presses produced by Elmes—but the customer report is typical in its praise of Elmes' craftsmanship in press design and manufacture. For all kinds of standard or special-purpose metal-working press applications, you'll be time and money ahead if you rely on Elmes Presses to do the job. Elmes Presses—whatever the type—bring you important performance economies. Elmes *Pipeless* Hydraulic Presses, which reduce costly down-time, give you *even greater* savings. Why not look into the many advantages offered by Elmes Hydraulic Metal-Working Presses? Individual recommendations and cost estimates will be supplied promptly on request.

WRITE FOR ELMES BULLETIN 1010-B

Illustrates, describes, and gives major specifications on complete line of Elmes Hydraulic Metal-Working Presses.

American Steel Foundries

ELMES ENGINEERING DIVISION

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of business is greater than an injustice dealt out to a trusted employee.

J Homewood
Tujunga, Calif

•

TRUE CONFESSIONS

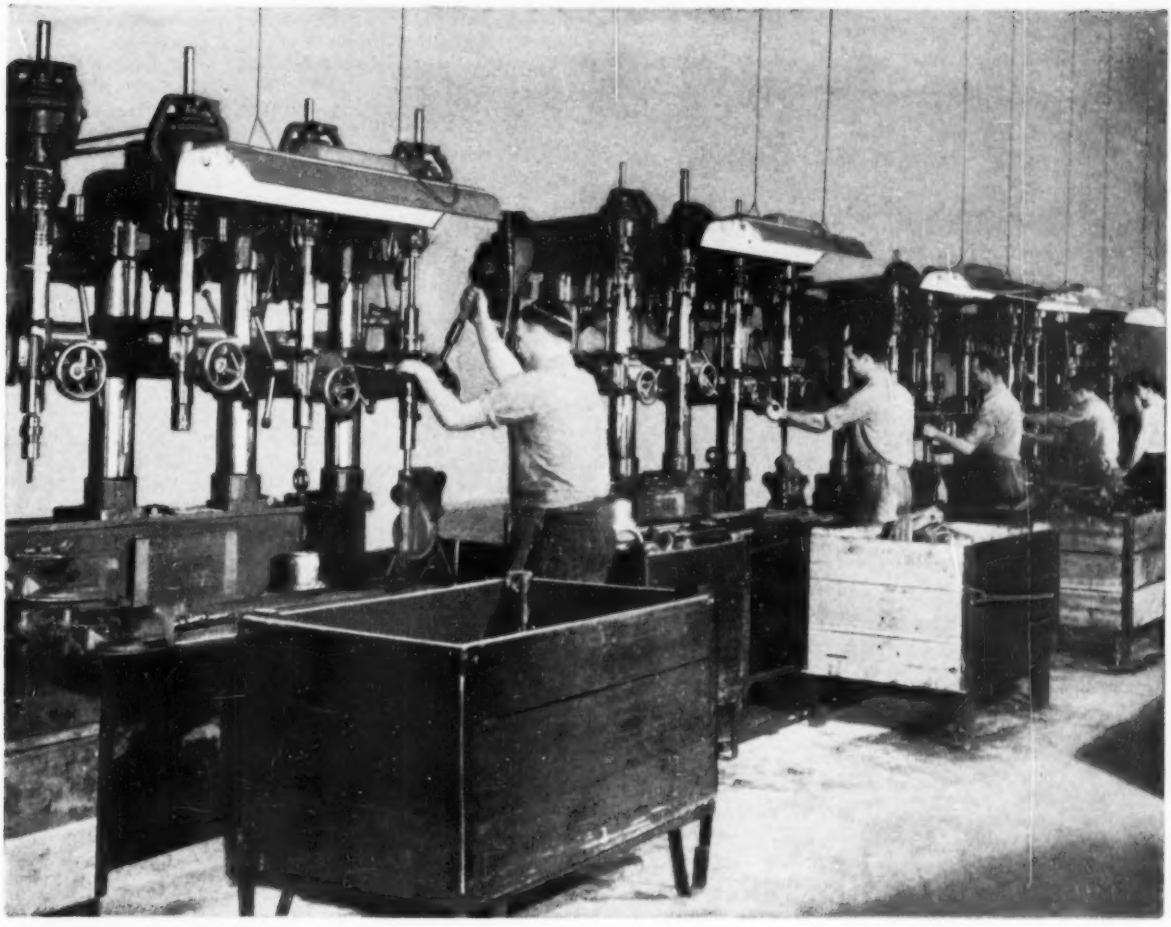
Should the executive always act as if he's right — and knows the answers? Can he afford to let somebody prove him wrong? Is his "feet of clay" or his cracked pedestal a sign of weakness — or of strength? Say some readers . . .

I DON'T QUITE understand Ed when he says he's stuck, and that he knew it would happen some day. Does he really confess he's such a poor foreman that he didn't expect to make good? Or does he mean that he's no expert on press tools? If he considers himself a poor leader of his men it's probably best for himself and the company he's serving to quit. Because this is more far-reaching than being stuck on a particular job. If it's only a press tool he's worrying about, my conclusion would be he's overdoing himself on a simple matter, which is not necessary at all.

If Ed is stymied because the press tool jams every third or fourth stroke, I can't see any objection to asking several of his experienced men to express their opinion on it. On the other hand, Ed ought to be able to realize that as long as the tool doesn't jam every stroke the trouble may be that the press in which it's set up is in bad shape. The ram might be so loose in the guides that it wobbles to and fro; perhaps this is the reason for jamming. Also the press shaft bearings may be so badly worn that the ram runs a little too far down now and then, causing the top part of the die to jam on the leader pins, or the punch may jam in the die.

Of course, it wouldn't do any good under any conditions to spread the word among the men that Ed is not able to handle his job. My idea is, however, that if a foreman never runs into any difficulties or makes any mistakes he isn't doing much useful work either. A foreman's ability to organize his department and select the right men to help him should be the best asset to his employer—he need not be an expert himself on everything, because no foreman in the whole world could meet and solve all the diversified problems arising in the shops everywhere and anywhere.

I don't think any of Ed's men, except perhaps the apprentices, would consider him a great oracle. If he



EASY WAY TO HIT PEAK PRODUCTION!

In this well-known meter plant, as in hundreds of efficient shops, they're jacking up drilling output this simple way: install the easy-handling multiple spindle "Buffalo" Drills your operation requires. You not only eliminate waste setup motions, but you get better accuracy, less worker fatigue and longer drill life.

In the photo above, the men on the four-spindle "Buffalo" No. 22 Drills are able to set up as many as four different drilling, tapping and reaming operations. Production flows right down the line easily and with minimum delays between operations. All controls and adjustment cranks are easily reached, so that these large-capacity machines are as easy to handle as smaller sensitive drills. Let us recommend a drilling arrangement to help cut *your* drilling time and cost!

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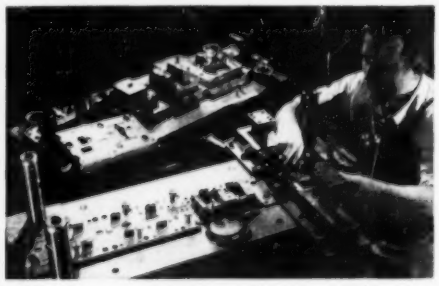
Top flight engineers specify "B. Jahn Dies" as a shortcut from drawing board to delivery date. The design and craftsmanship embodied in every B. Jahn Production Proved Die eliminates all guesswork, all trial and error — guarantees flawless die performance . . . die economy . . . die quality!

Thorough inspection of this 10 station progressive die for producing clips to link 60 caliber machine gun shells insures minimum time from production line to battle line. PRODUCTION PROVING from 10 to 50,000 pieces from the die guarantees "proving ground" quality like this —



1. B. Jahn recommends the *right* tools and dies for each specific requirement.
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handles his men fairly they'll help him out in any situation however difficult. And I don't share Ed's fear of hurting his position by discussing any problem with some of his men. Of course, it depends on how he puts it to his helpers. If he takes the position of a browbeater, he can never get the best out of his men.

In this case he should have a man in his crew who is an expert on press tools to consult; he should have specialists on each type of tool requiring discussion. If Ed organizes his department that way he'll have no difficulties on any tools.

I agree entirely with Al that workers are bound to work better for someone who is a human being, and not an oracle pretending to know all the answers. I don't think Ed's men would respect him more if he tried to be a super-human. People nowadays know this is an impossible thing.

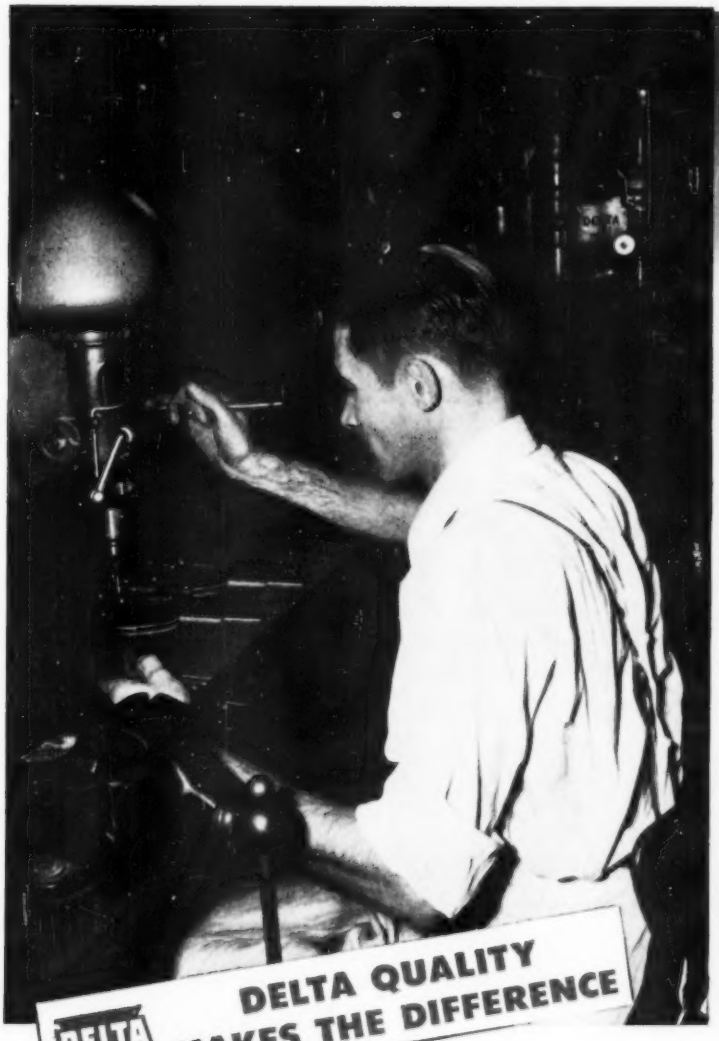
A E Fristedt
Stockholm-Bromma, Sweden

IT SEEMS THAT our friend Ed has built up in himself a false notion that he stands on a par with the Almighty and can strut around with impunity feeling that he is supreme in brain power. He no doubt is under the impression that an admission of defeat is destructive to the foundation supporting the structure of executive control. He is fooling no one but himself when he tries to make an impression on his men that his knowledge is beyond criticism.

In contrast to Ed we have the meek and honest type who goes along with the feeling that two heads are better than one and that there may be times when his analytical powers are subnormal; honest cooperation between the foreman and his men will considerably augment any lack which may exist.

Unfortunately there are some

"Okay!! So that ten-inch maybe did break his leg—You don't think he's going to have it looked at during his lunch hour!!"



TOOL SHOP SHORT CUT—

A DELTA Drill Press on Every Work Bench Saves Time and Money for BINGHAMTON DIE & MACHINE CO.

"It's much cheaper to install an individual 14" Delta drill press on every diemaker's bench than to move men and machines," says Frank Bowie, owner of this thriving Binghamton, N.Y., shop.

Making dies for big shoe factories is his main business, and on most jobs more than half the operations are done on a Delta drill press.

"Accuracy is absolutely essential," says Mr. Bowie, "and we've had remarkable service from our Delta drill presses—for 16 to 18 years, in some cases. At times we use them as arbor presses, and still they stay accurate. They're not babied, either—used night and day in rush periods. Maintenance cost is negligible—no more than $20 per year on all our Delta equipment."

No waiting, no running back and forth—a Delta drill press on every work bench increases Binghamton Die & Machine Co. profits.

In addition to 18 Delta 14" drill presses, the company has a 17" drill press, three Delta grinders, a 14" bandsaw and a disc grinder.

You, too, can save money with low-cost, high accuracy Delta tools. It costs you so little to have Delta tools throughout your shop—they're ready to use without waiting, eliminate set-up for special jobs, and are easy to relocate at any time.

Do you have up-to-date Delta literature? Send for Catalog AB-52; and call the Delta dealer—listed in the Classified Telephone Directory under "Tools." Write Delta Power Tool Division, Rockwell Manufacturing Company, 618J N. Lexington Ave., Pittsburgh 8, Pa.

Delta drill presses are available in floor and bench models.

DELTA QUALITY POWER TOOLS

Another Product of **Rockwell**

"WHO CUT THIS 0.0006" UNDERSIZE?"

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DO YOU NEED A "PUTTIN'-ON-TOOL"

for salvaging undersize parts, worn tools and gages right in your own plant?

Now, with the Chromaster industrial chrome plating unit, you can restore undersize components or worn tools to exact dimensions, easily and simply, in a matter of minutes. With Chromaster, you will be able to salvage thousands of dollars worth of material you're now throwing into the scrap bin.

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- **CHEMICALLY STABLE PLATING SOLUTION**
- **LOW PLATING COST . . . only 7 mils per sq. in. .002" thick**

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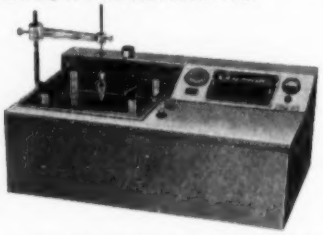

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Model A-20 is a 20-amp, bench-mounted unit for the gage room or tool crib; plates up to 10 sq. in.

Model A-50, 50-amp, bench-mounted unit for larger shops in plating of cutting tools. Plates up to 25 sq. in.

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workers who do not appreciate honesty in their boss. Some of the boys will get a kick out of any foreman who is honest enough to come out in the open with his troubles and are inclined to make amusing yak-yak at his expense, sneeringly intimating that anyone who does not know his business should get himself another job that he can handle. Why let a few smart alecks cause a man to hesitate in admitting that he is baffled when an honest confession will result in closer cooperation from the better element of his workers? The man who thinks he is perfect is on a par with the one who claims that he never made a mistake; usually one will find that the man who never makes mistakes usually doesn't do anything.

Between the two types mentioned above we have the self-styled superbrain who knows that he doesn't know, but tries to convince another that he is right. Usually this chap will get into an argument—which, by the way, is decidedly wrong for a foreman to indulge in—and in the course of the heated bla-bla will wind up on your side of the fence while your chin drops with the feeling that you don't know your south portal from a hole in the ground.

This type is rare, so we'll let him remain outside of the picture while we discuss the first two: the "know-it-all," and the "meek and lowly" who takes the attitude that brains are evenly distributed and that many of a super type will show up if given the opportunity. I have had the experience of working for both kinds of foremen and I have always had the highest respect for the men who humble themselves to admit that they were stumped when encountering problems too difficult for immediate solution.

The qualifications of a foreman do not include infallibility; it must be

"The job came in twenty minutes ago, but you're already getting the business that it should have been finished yesterday."

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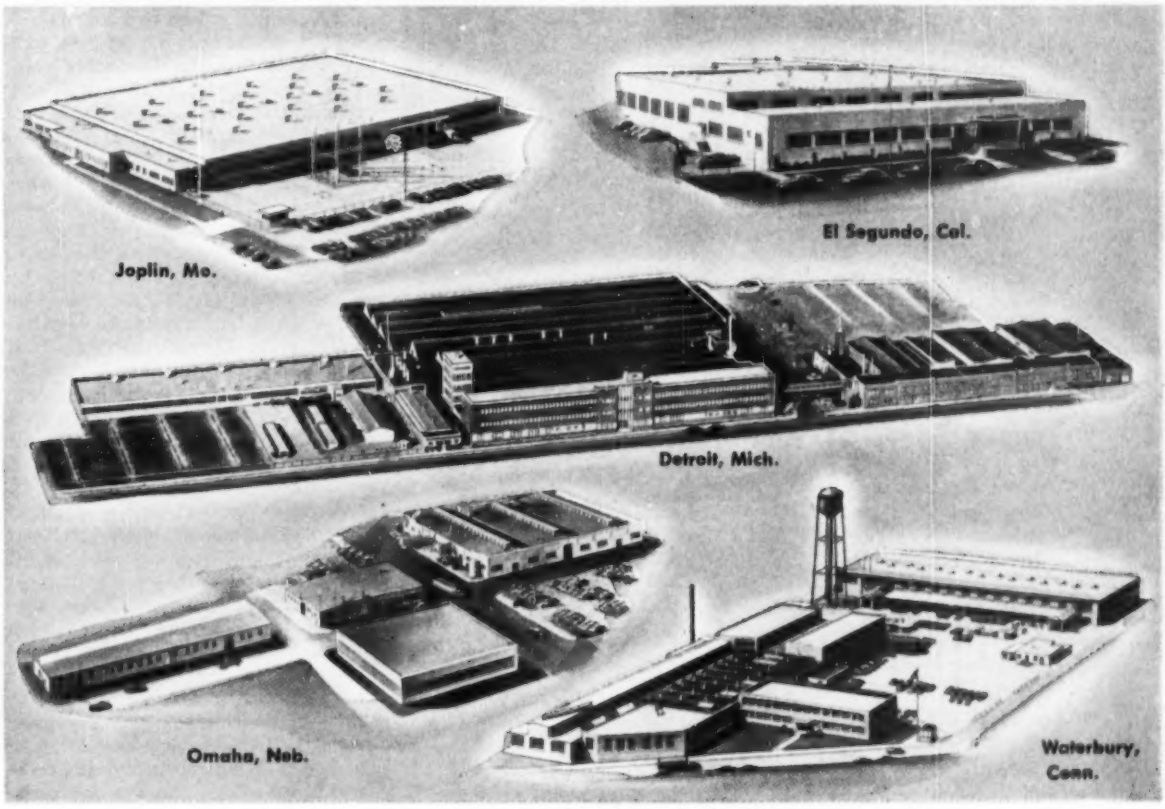

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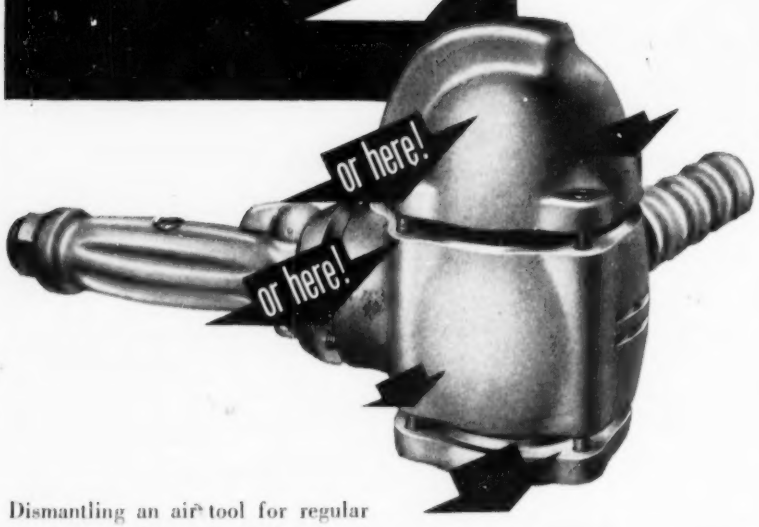
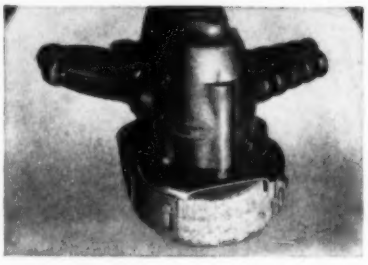


Dismantling an air tool for regular inspection and maintenance is one way to insure better air tool performance.

Unfortunately, it's also one way to wear out or strip threads in tool housings—and that means re-tapping the holes and using oversize screws, which adds to tool maintenance time and costs.

Fortunately, this can't happen to you—if you're using Buckeye tools—because every threaded hole in Buckeye tool housings has a *replaceable* Heli-Coil insert. That means you always drive screws into a hardened steel thread—so you can't wear or strip threads in the housing—ever.



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remembered that foremanship goes beyond technical know-how, and that knowledge of human nature and sympathetic understanding must be taken into consideration as well. The good foreman may not be able to give a snap decision on a moment's notice, but you can depend upon it that if given time he will be able to fathom it to a reasonable solution. You'll find this chap will confide in his men and in so doing will draw from them priceless jewels in constructive thought. We sometimes say that a man isn't hired for what he does but for what he knows. There is only one way to find out what a man knows and that is to penetrate beneath the surface by honest research usually initiated by a sincere admission of inadequacy.

The pedestal type, that egotistical bi-ped usually encountered with the swelled head, is one who makes my blood boil. My first encounter with this descendant of the pre-historic jackass occurred when I was a youngster just starting out as a journeyman machinist, when twenty-seven cents an hour was tops. I was eager to make an impression, as all progressive youngsters are inclined to do, and offered the foreman several good suggestions about the job I was working on. Instead of encouraging me for my incentive and keen interest in progress, he lost no time in informing me, to my utter chagrin, that he was the foreman of the shop and that if any improvements were to be made in the work, he would be the one to do the telling about it. I complied with the demands of my self-respect, told him where he could put his job, and lost no time in seeking the outside for a breath of clean air.

There are probably many more of this kind of executive holding down jobs, but you can lay it on the line

"We don't know how it works, but we're sure getting production."

You're missing something if you don't remember CRUCIBLE HOLLOW TOOL STEEL

If you manufacture tool steel parts with cutout centers, and your aim is to reduce production time and costs, you can't afford to overlook Crucible Hollow Tool Steel. It comes in three famous grades: KETOS, AIRDI 150 and SANDERSON.

You don't have to drill and bore solid bars anymore. For these quality brands of tool steel are immediately available with machine-finished inside and outside diameters and faces — cut to your specific length requirements. And they come in a wide range of sizes.

By eliminating drilling and boring operations, Crucible Hollow Tool Steel will lower your production time per unit . . . increase your machine capacity . . . and reduce your scrap losses.

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Just what *can* a SHELDON Lathe do?

A 10", 11" or 12" Sheldon Precision Lathe can work to the closest tolerances and hold its accuracy because it has "Zero Precision" Tapered Roller Bearings. It can operate at a wide range of speeds, has an efficient underneath drive (4 speeds open belt, 4 speeds through back gears). Its double V-belts to the spindle will deliver enough sustained power to take really heavy cuts with high speed "open belt" operation. It will cut from 4 to 224 threads per inch with the shift of two tumblers on its full quick change gear box (54 different pitches including 27 t.p.i.). It will provide big lathe collet capacity—a 1⅛" hole through the spindle.

A Sheldon Precision Lathe will do most of the everyday lathe work now done on larger more expensive lathes, and do it faster, easier and do it with lower power costs, in less floor space. It can lower labor costs because it can be safely operated by less experienced operators. It can pay off its cost in a short time, and will stand up and hold its accuracy after it has earned its cost.

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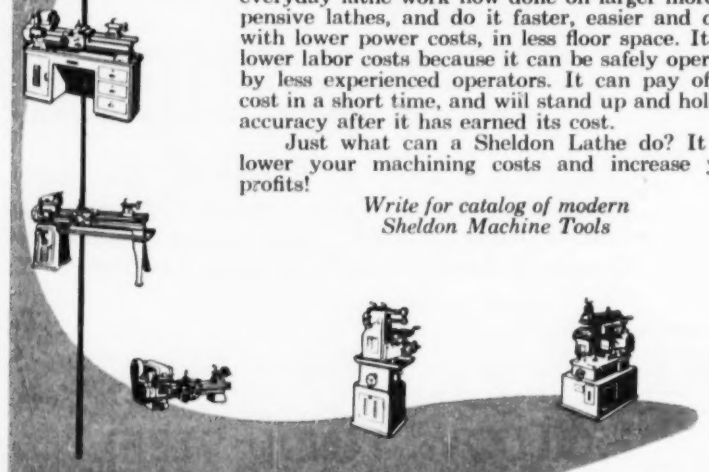


SHELDON MACHINE CO., INC. 4234 N. KNOX AVE. CHICAGO 41, ILLINOIS

that they do not command the respect and cooperation of the self-respecting members of the working force. Just because a man has on a pair of overalls or an apron doesn't imply that he hasn't an active brain. The chances are that were he in the foreman's position he would be able to solve many of the problems puzzling the boss. Executive ratings are not based entirely on ability to solve shop problems; understanding of human nature and ability to evaluate the workmen under him is a prime requisite for the foreman's successful handling of subordinates.

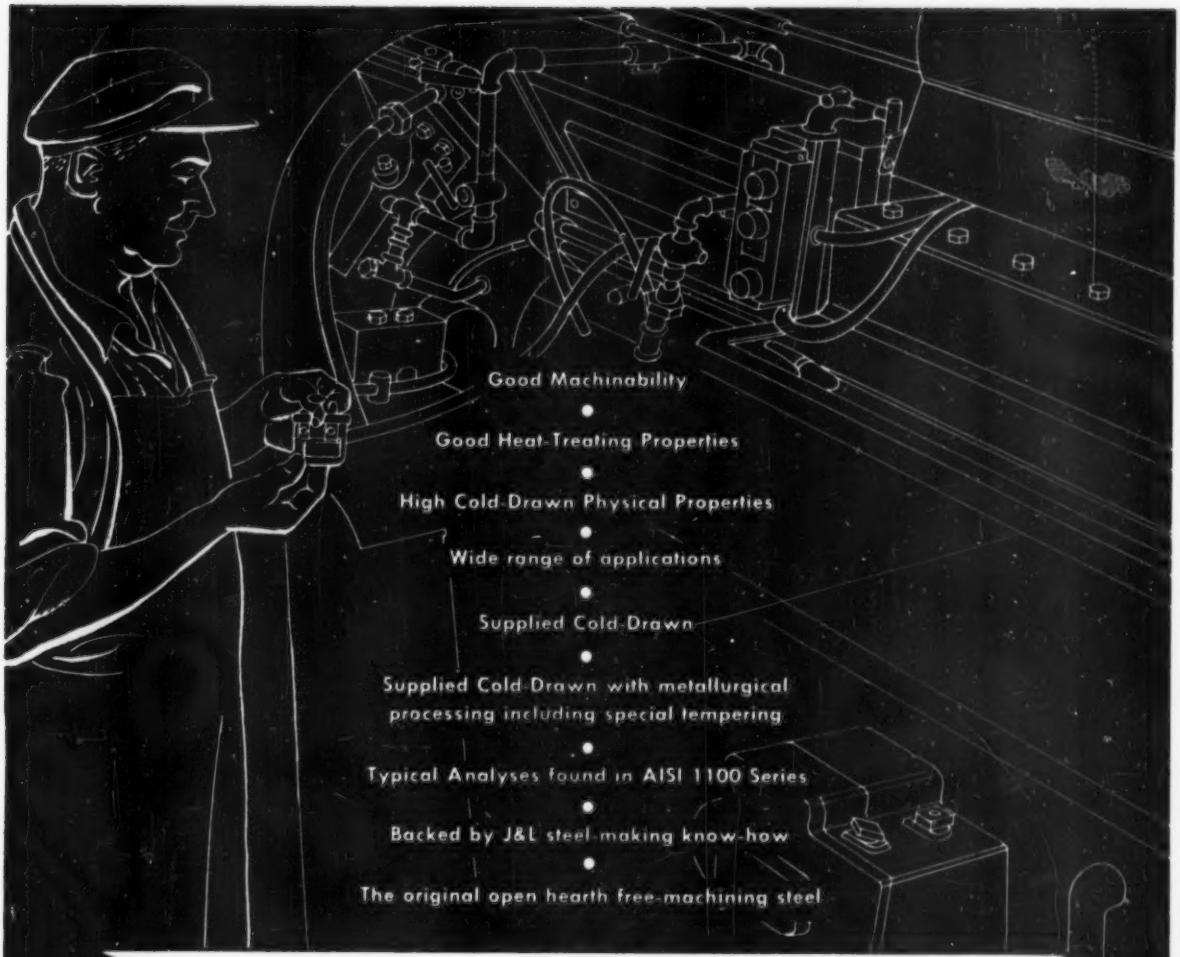
J Homewood
Tujunga, Calif

I DON'T PROFESS to be a mental wizard and don't claim to know all the answers, but I do know that there are times when it doesn't pay to let the other fellow know everything—especially a subordinate. One might gain a little information quicker by calling upon the men under you to help you out in an emergency, but what you gain in immediate help is greatly overbalanced by the loss of prestige, or face—which you value most.

I have always felt that a foreman should be on a higher plane, cerebrally, than the men under him and if, by any remote chance, he should be put in a position whereby he was absolutely stuck as to how to proceed, he should resort to a little bluffing. I am not in favor of bluffing one's way along constantly, but when a "teentsy-weentsy" bit will contribute to the ultimate goal—I say call it.

During my hey-day, when I had more ambition than sense, I delighted in analyzing various phases of foremanship science. I did my very

"We allow 'em to take home most anything —so long as they pay for it . . ."



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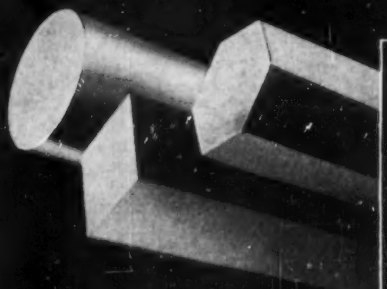

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Of course, only one shop in a thousand needs these giant gages—but only one in a thousand has the experience and equipment for handling such precision. That's why Perfex is a better source for *all* your gage needs in thread rings and thread plugs, as well as specials. We still make 24 to 48 hour shipments on *most* standard thread plugs, from 0-80 NF to 1½"—6 NC, class 2 and 3. Our facilities include the finest grinding and checking equipment, operated under controlled temperature conditions, by a constantly growing force of the country's highest-skilled gage-makers. We're proud to offer you a superior product and service to match. Please write for copy of our new catalog and name of the Perfex representative near you.

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The right COOLANT PUMP for each PURPOSE

RUTHMAN GUSHER COOLANT PUMP

This Marvel #24 Hack Saw is equipped with a Gusher Coolant Pump. Photo Courtesy Armstrong-Blum

There's a Gusher to fit almost any requirement as to type of intake, discharge, position on your machine, and pumping capacity.

Choose between immersed type, outside mounted pipe connected, flange mounted with external or internal discharge in capacities up to 200 G.P.M., Motor (1/30 to 2 HP). Also, shaft, and belt driven models are available. Write today.

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best to create the impression that I knew enough, or a little more than necessary, about the business I was being paid to direct. There were times when problems confronted me that were inclined to get me down, but I did not weaken the timbers of leadership by acknowledging defeat. I did not ask any of my men to tell me what was to be done. I was hired to do the job and I felt it was up to me to do it.

I'll admit that good ideas come from the minds of some of the workers, but there are ways and means of getting these ideas into the open without tearing down your own influence. A foreman can be tactful under difficulties and gain valuable information if he will just keep his ears and eyes open. He may have to pull a school-teacher stunt occasionally and say that he is too busy at the moment of crisis, then high-tail it to his office to think through the problem, or possibly sleep on it that night. He does not have to sow the seeds of criticism and ridicule by openly seeking his workers' help. An honest confession may be good for the soul but sometimes it raises particular hell with your standing among your men. I don't mean that a foreman needs to know it all; he's only human and his capacity is limited, but with tact and study he can gain his end unbeknown to those who are working under him.

Maintain the upper hand by acting your age and giving the impression that you know your business even though there are times when you get in a jam and can't figure something out. Don't be a sucker and throw in the sponge, or the first thing you know you'll be handing out tools from the crib.

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San Francisco, Calif

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The "All-Weather" Bearing Lubricant! Steel mills have shown a lively interest in Tycol Acylkup 4, a year 'round bearing grease that does a variety of jobs with a complete disregard for thermometer readings. Although all methods of application are suitable, one "3-Furnace" mill has found it particularly adaptable for use in its automatic grease systems – with complete ease of pumping even in the coldest weather. From Blast furnaces: Sheave Bearings, Bell Mechanism, Skip Hoists, etc. . . . to Coal and Ore Bridges, Tycol Acylkup 4 is a natural for lubricating yard equipment in every steel mill. With two big savings: "all weather" protection . . . and lowered maintenance costs on automatic pressure systems. For details, contact your local Tide Water Associated office!

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NOW greater versatility greater efficiency

TO IMPROVE cutting efficiency and production, three models of the Wells Metal Cutting Band Saw line are now available with expanded range of cutting speeds as standard equipment. The table below shows the new speed ranges for these outstanding machines . . . Wells Nos. 5, 8 and 12 . . . first in the horizontal field. Higher speeds are available when required.

The new cutting speeds coupled with such proved Wells advantages as sturdy construction, ease of operation, real dependability and low cost make these machines even more profitable for you to use. Ask your Wells Dealer for full information or write, requesting catalog G-52 giving specifications and design details for all models.

Model	Capacity		Selective Cutting Speeds
	Rounds	Rectangular	
No. 5	5" O.D.	5" x 10"	50, 90, 160, 250 f.p.m.
No. 8	8" O.D.	8" x 16"	50, 100, 175, 275 f.p.m.
No. 12	12¾" O.D.	12" x 16"	60, 115, 200, 300 f.p.m.

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METAL CUTTING BAND SAWS

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NEW BOOKS

THE UNION CONTRACT CLAUSE FINDER. *By the Staff of Employee Relations Bulletin. Published by National Foremen's Institute, Inc, New London, Conn. 91 pages, 8½ x 11. Loose-leaf, three-ring, fabricoid binder. Price $7.50.*

Based on a study of 3000 union contracts, this book is a commentary on the aims of both labor and management in the bargaining process.

Background material is included in the opening section, "The Legal Duty to Bargain." In this section the legal rights and duties of both parties to the bargaining process are described.

Succeeding sections follow a standard pattern of development. First, the problem is stated and amplified. Then specific clauses from actual contracts are cited, showing how the problem has been solved in actual practice.

This method of organization provides a handy reference for negotiators, by keeping the problem and its implications clearly before the bargaining parties, and helping to guide the negotiation by showing successful solutions to the problem at hand.

•

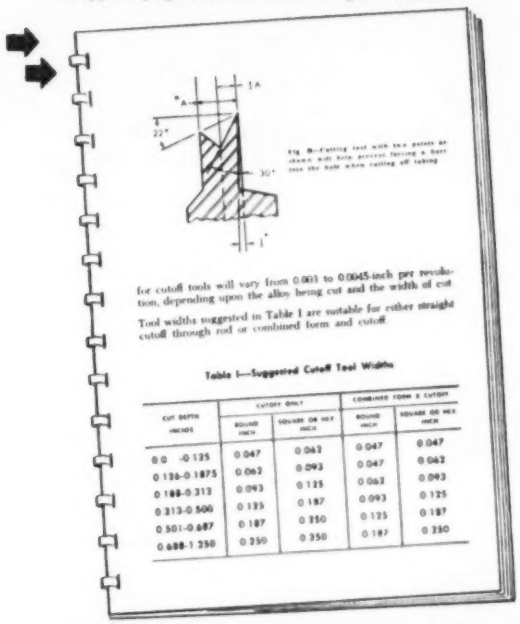
SMALL SOLID RIVETS. ASA 18. 1-1953. *Published by The American Society of Mechanical Engineers, 29 West 39th St, New York 18, N Y. Price, $1.*

Earlier standards on small rivets and on tinners', coopers' and belt rivets, respectively, have been combined in one standard. There are no substantial changes in basic dimensions, but dimensional tolerances have been developed. Sizes range from 1/16 to 7/16 in.

"Goodness! Is it time to start back to work already?"

CUT MACHINING COSTS WITH ALUMINUM

A typical page from the machining handbook.



for cutoff tools will vary from 0.003 to 0.0045-inch per revolution, depending upon the alloy being cut and the width of cut

Tool widths suggested in Table I are suitable for either straight cutoff through rod or combined form and cutoff

Table I—Suggested Cutoff Tool Widths

CUT DEPTH INCHES	CUTOFF ONLY		COMBINED FORM & CUTOFF	
	ROUND INCH	SQUARE OR HEX INCH	ROUND INCH	SQUARE OR HEX INCH
0 0 -0.125	0.047	0.062	0.047	0.047
0.126-0.1875	0.062	0.093	0.047	0.062
0.188-0.313	0.093	0.125	0.062	0.093
0.313-0.500	0.125	0.187	0.093	0.125
0.501-0.687	0.187	0.250	0.125	0.187
0.688-1.250	0.250	0.250	0.187	0.250

THIS HANDBOOK* TELLS YOU HOW

The handiest, most helpful handbook you can get on the machining of aluminum alloys is yours for the asking. This book evaluates the various aluminum alloys and recommends machining methods and tools that give maximum production economies. There is a special section on automatic screw machining. Every designer, production engineer, plant manager and machine shop superintendent needs this 124 page "Machining Aluminum Alloys" on his desk. Write on business letterhead for your FREE copy and a complete index of Reynolds technical literature to Reynolds Metals Company, 2523 South Third Street, Louisville 1, Kentucky.

*One in a series of handbooks on aluminum design and fabrication.

"Mister Peepers" returns September 13th on NBC-TV.

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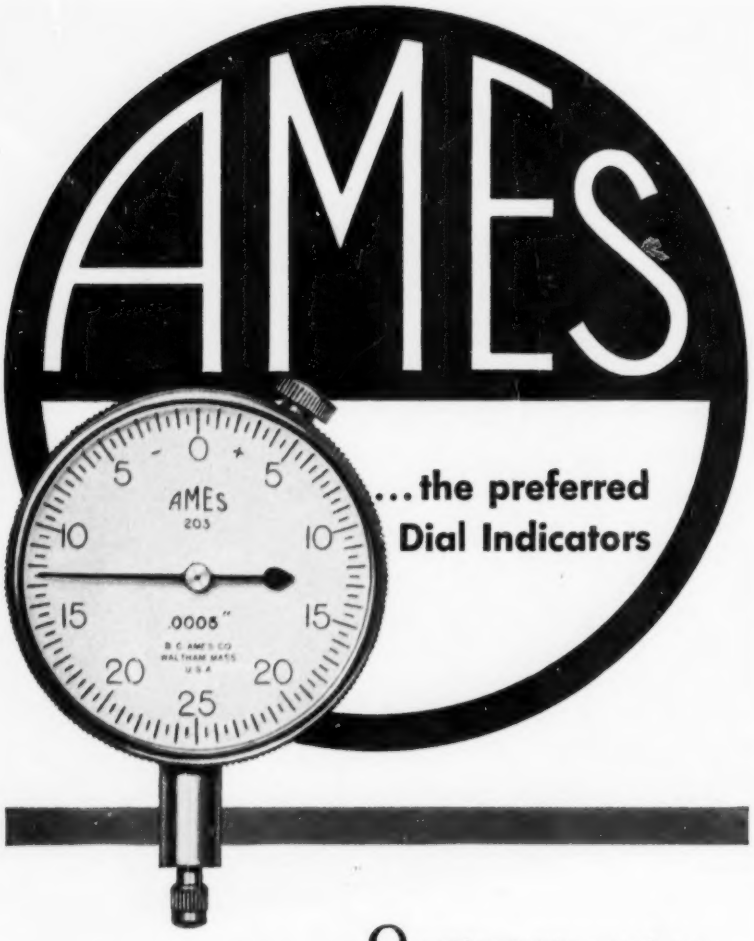

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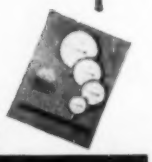

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WELDABILITY OF STEELS—*By Robert D Stout, Prof Metallurgy, Lehigh University, and W D'Orville Doty, Welding Metallurgist, U S Steel Corp. Published by Welding Research Council, 29 W 39th St, New York 18, N Y. 381 pages, 6¼x9¼. Price $6.50.*

Because weldability cannot be discussed properly without a basic understanding of the welding processes and the terminology involved, the early chapters of this new book cover these phases briefly but effectively. The third chapter deals with metallurgy and its relation to welding, and considers the thermal effects of welding on steel. Succeeding chapters cover the properties of steel in relation to weldability; factors affecting weldability in fabrication and for service; welding procedures, and an evaluation of the various weldability tests.

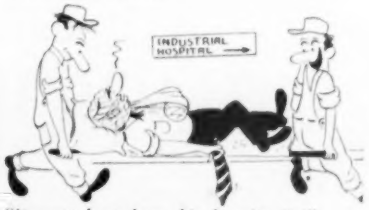
An extremely useful part of the book is a 50-page appendix consisting of tables giving the various types of steels and recommended welding procedures for different thicknesses.

•

STANDARD COSTS FOR MANUFACTURING. *Second Edition. By Stanley B Henrici. 336 pages. Published by the McGraw-Hill Book Co, 330 West 42nd St, New York 36, NY. 6x9. Price $5.50*

In preparing the second edition of this book in the McGraw-Hill Accounting Series, the author has added more problems at the ends of many chapters. His purpose was to help the reader to apply the text's topics.

The book briefly treats a number of topics having to do with installing and operating a standard cost system. Consideration is given to standardization of factory operations and establishment of standard costs. Chief values of the book appear to be (1) a round-up of the principles involved for the benefit of various kinds of production and executive personnel so that they understand the importance and functions of accounting procedure, and (2) to serve as an introductory text for junior accountants entering the industrial accounting field.



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with Super Precision Roller Bearings and Separate Thrust Bearings

The picture shows you why this Spindle has swept the field for 6" x 18" surface grinder application (producing finer finishes at lower cost)—and why it has been promptly drafted for hundreds of other jobs.

There are many types of bearings but none can approach the superb combination of ruggedness and precision found in the double row cylindrical roller bearings you see in this Spindle. They have tremendous load carrying capacity, produce a superior finish and assure long, trouble-free operation.

Note the thrust bearings. There is no endwise movement of the shaft in either direction.

Spindles have the Pope System of lubrication and are dynamically balanced in full assembly.

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tracer-controlled multiple spindle machine automatically mills 14 jet engine compressor blades simultaneously

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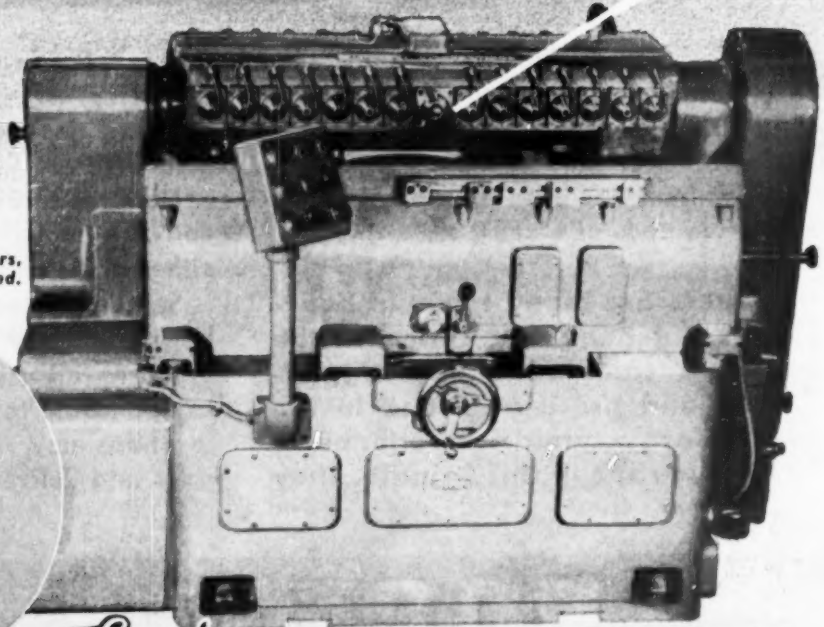
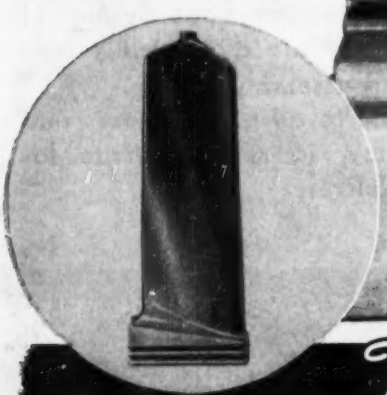
Tracing from a master the desired contour is machined by hydraulic control on 14 blades to accuracies and finishes that reduce final operations to a minimum.

Also tracer valves, cylinders, power units specially designed.





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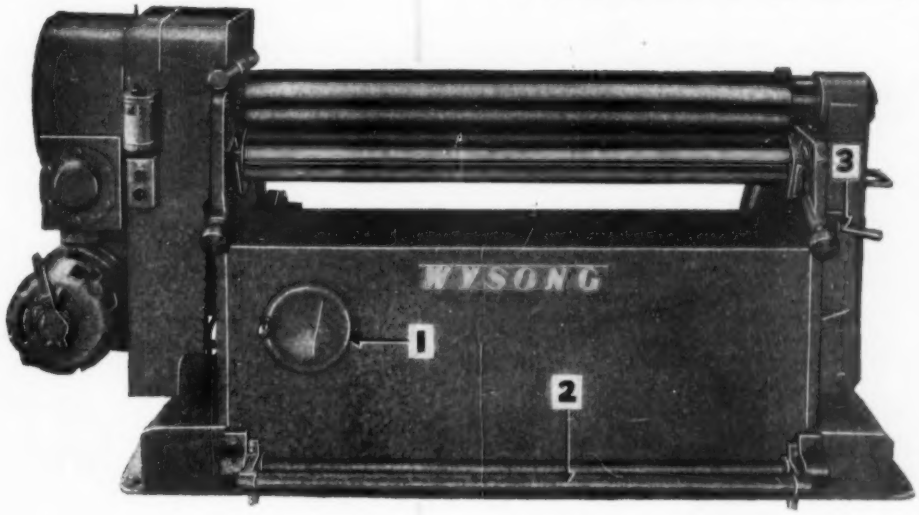

Wysong all-steel, 5 inch bending rolls are of the initial type. Frames are all-steel weldments. Rolls are accurately machined alloy-forgings. All rolls are power driven. Main gear drive runs in a continuous bath of oil. Drive is by V-belts. Drum control provides forward, reverse or neutral.

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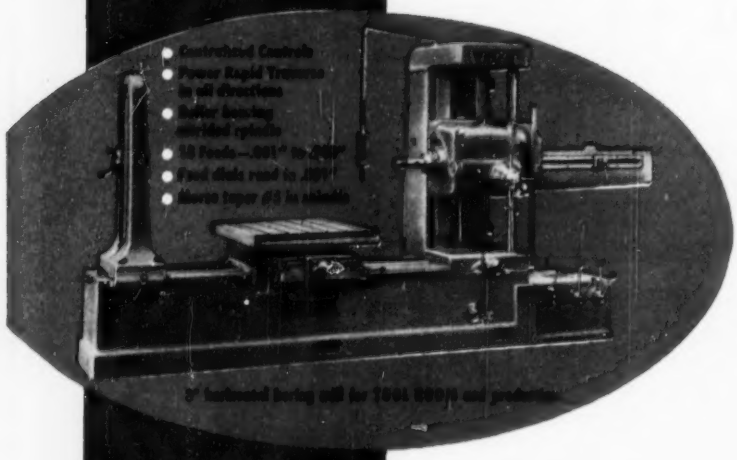

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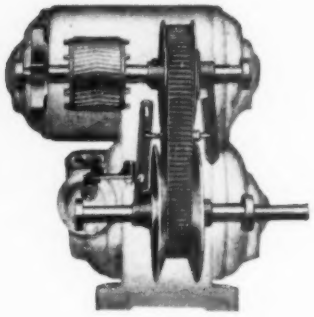

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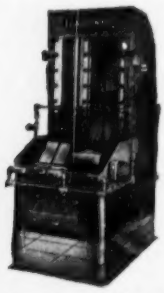
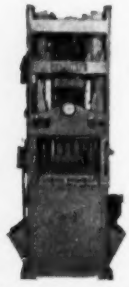


DRV

3 to 25 ton, 30" to 90" stroke



VPU

10 to 25 ton, 36" to 60" stroke

VPD

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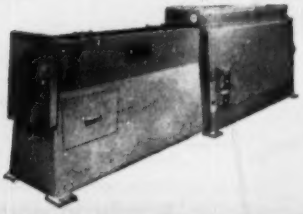

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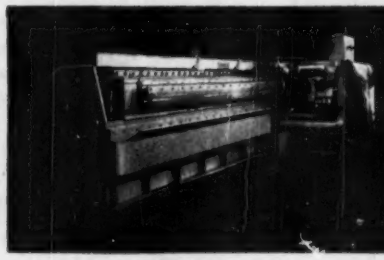

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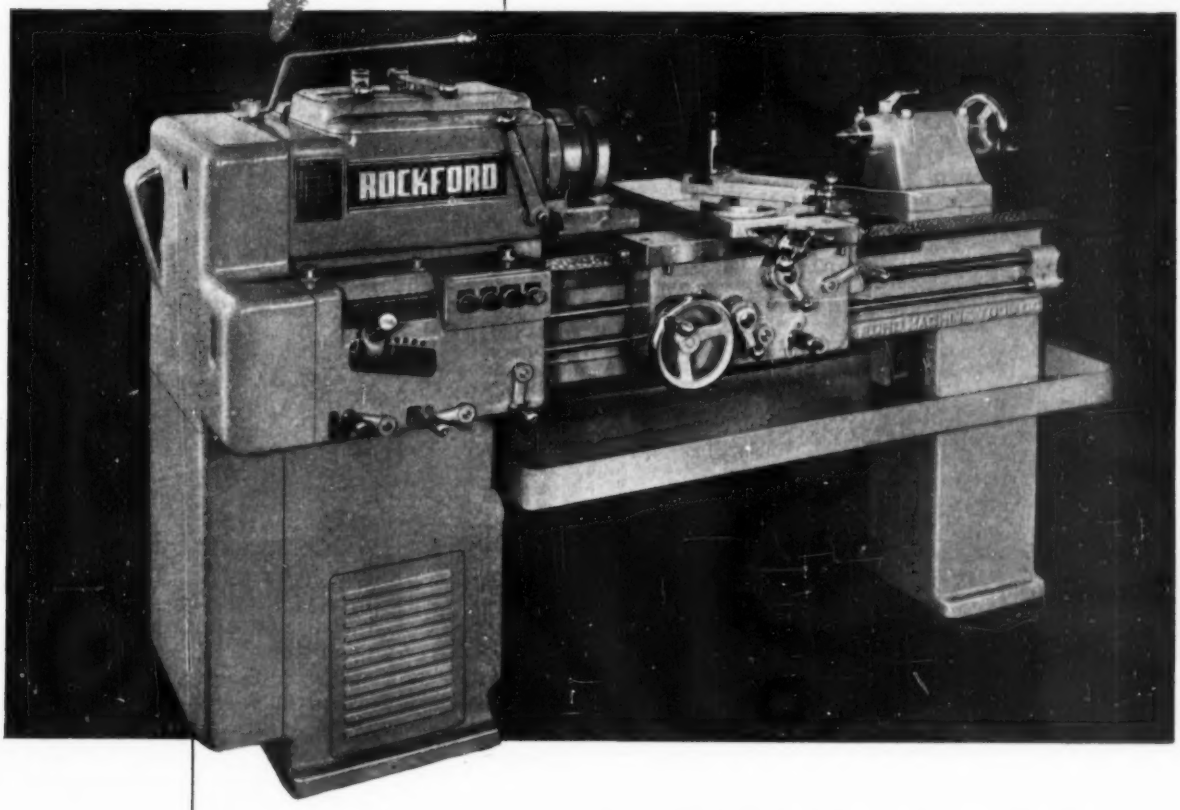

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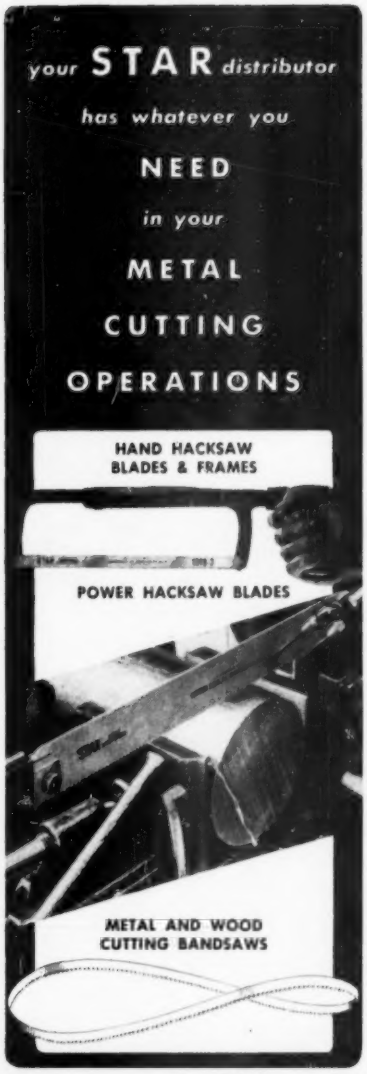

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BRITONS CAN HAVE PROSPERITY —If They Want It

What is required to get Britain, our key ally in the grand alliance of the free world, firmly back on her economic feet? The purpose of this message is to throw light on this crucial problem, which afflicts our other European allies also.

At the moment, Britain is enjoying a respite from the economic crises (of 1947, 1949 and 1951-52) which have plagued her postwar course. This respite may well continue for some time. But almost no one whose judgment is trustworthy believes that Britain has acquired sufficient economic strength to safeguard her against further economic crises in the years immediately ahead.

Two British Views

New and clear light on what should be done to that end has recently been shed by two noteworthy British publications. One is a book, "We Too Can Prosper," by Graham Hutton, distinguished British economic writer and administrator. The other is an article, "The Riddle of Prosperity," published by THE (London) ECONOMIST, Europe's most eminent economic journal.

Combined, these two publications present in sharp relief the basic problem that must be handled successfully if Britain is to be safely solvent. As is implied by its title, ***the Hutton book demonstrates that Britain can be made prosperous by readily feasible procedures, patterned on what has been done in the United States, to increase its industrial efficiency. But, says THE ECONOMIST, with Mr. Hutton's book in mind, this is not the most basic problem, which is, "How shall we make the British people determined to be prosperous?"*** This is a problem of incentive or motivation.

Compared with that of the United States, average industrial efficiency in Britain, as in most of Western Europe, is low. In his book Mr. Hutton remarks that "fifty years ago an American industrial worker turned out roughly the same amount in a day as his opposite number in Britain, Germany or France. . . . Today, he turns out from two to five times as much."

In large part it is this lag in output per hour or "productivity," as the technicians call it, which makes Britain and other key countries in Western Europe a continuing prey to economic crises. Moreover, the great disparity in productivity between the U.S.A. and most

of Western Europe is a major barrier to knitting the free world into a smoothly working economic whole. As one observer put it, "when the American economy catches a cold, the European economy gets pneumonia." This is largely because Europe is so much weaker in productive strength.

No Shortage of Knowledge

Yet the knowledge which would enable the countries of Western Europe, and particularly Britain, to increase their industrial productivity has been mobilized and is readily available to them. It is with this process for Britain that Mr. Hutton's book is concerned. In the book he summarizes the findings and conclusions, virtually all of them unanimous, of 66 teams, composed of British industrial managers, technicians, shop workers and labor leaders. Over a period of three years these teams completed a comprehensive series of inspection and study trips in the United States under the sponsorship of the Anglo-American Council on Productivity. The product of that effort, he remarks, is "a set of documents the like of which, on such a scale and of such practical value, has never been seen in the history of international and cultural borrowing."

Psychology the Key

From study of these documents, Mr. Hutton concludes that better capital equipment is the key technical ingredient of higher industrial productivity in Britain, and constitutes "the most urgent . . . need of British industry." But he finds that ***even without new capital equipment a "15% rise in productivity can still be achieved by reorganization of work," and that such an increase would "solve Britain's chief social and economic problems."***

Then why is not such an increase in productivity, demonstrated by the Anglo-American productivity teams to be so clearly within technical grasp, promptly forthcoming? Mr. Hutton, quoting one of the team reports, remarks that, ***"'the greatest obstacles to increased productivity are psychological rather than technical.'*** We have to deal first and foremost with men, not machines." And THE ECONOMIST, pursuing the line of inquiry suggested, reaches the conclusion that, by and large, the people of Britain do not want to prosper by being more efficient. THE ECONOMIST says:

> "The real secret of American productivity is that American society is imbued through and through with the desirability, the rightness, the morality of production. . . . But in Britain, if any moral feeling at all survives about economic matters, it is usually a vague suspicion that economic success is reprehensible and unworthy. From this difference in attitudes everything else follows."

"How," asks THE ECONOMIST, "shall we set about restoring some belief in the rightness of effort, the morality of success?" For this question it has no ready answer. Neither have we. We are confident that the British people will neither be cajoled nor coerced into trying to match our productivity. Basically the problem seems to be to demonstrate clearly to them the truth of the proposition, set down by Graham Hutton, that "there is no goal, aim or end before a Good Society which the raising of that society's material productivity cannot render easier of achievement." Doing that in an old and settled country like Britain is obviously an extremely formidable undertaking. But ***until it is done, the crucial job of getting Britain and the rest of Western Europe firmly on its economic feet will remain to torment all of us.***

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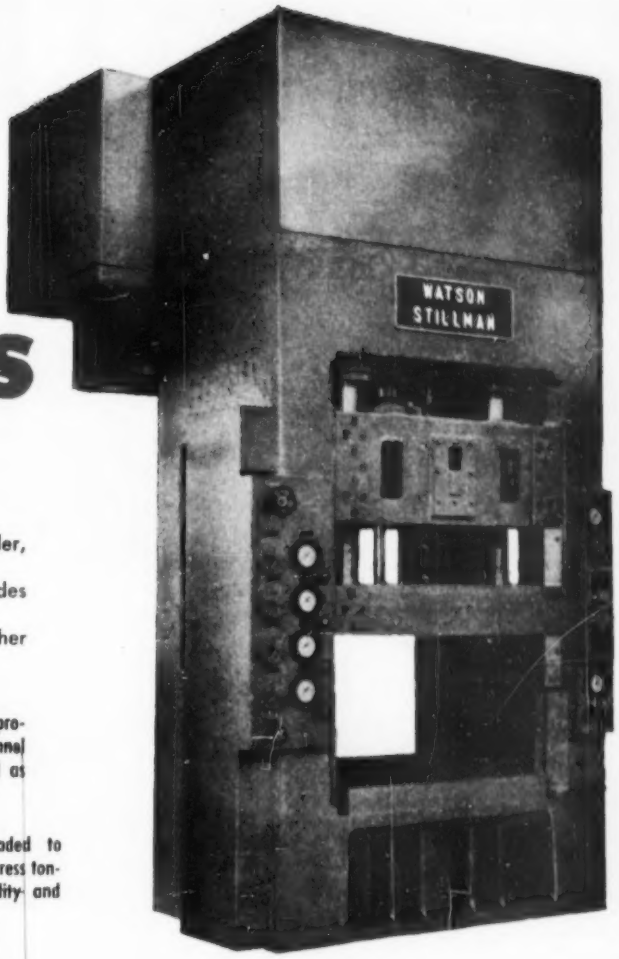
FOR YOUR HIGH-SPEED DRAW JOBS



These features tell the story –

- Adjustable Pressure and stroke on main ram, blankholder, and cushion.
- Main ram pressure and/or position reversal provides maximum protection to press and dies.
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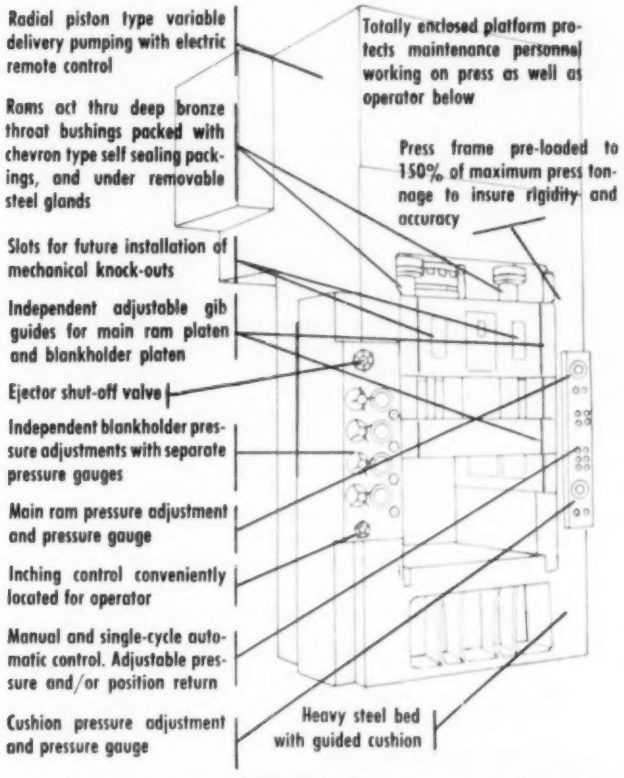
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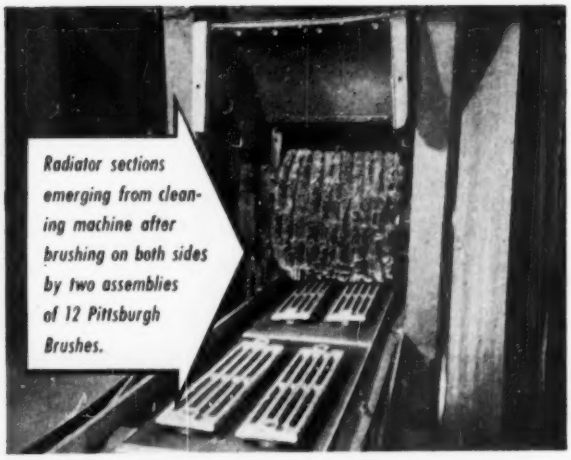
Radiator sections emerging from cleaning machine after brushing on both sides by two assemblies of 12 Pittsburgh Brushes.

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Cleaning Narrow Spaces—National Radiator Company, Johnstown, Pa., cleans 30,000 radiator sections a week! To insure a perfect final finish, even the narrowest spaces must be absolutely clean prior to assembly. Pittsburgh engineers were asked to design a brush that would reach these spaces and would fit National's existing machine. Successful? National reports: "Pittsburgh Brushes do a better job of cleaning and are more economical!"

Preparing Chills—At Continental Foundry & Machine Co., East Chicago, Indiana, chills used to cast iron rolls must be cleaned of the oxidized metal remaining from previous usage, as well as dirt and grease accumulated in storage. After experimenting with other brushes, Continental chose Pittsburgh because they "do the job better and stand up longer than any previously used!"

Improving Original Equipment—The Sommer and Maca Glass Machinery Co., Chicago, Illinois, uses Pittsburgh Brushes in the automatic washing machines they manufacture. Brushes formerly used simply didn't have the over-all density pattern needed. Pittsburgh engineers studied the problem and designed a brush which Sommer and Maca approved "because of (its) denser bristle pattern and lower cost."

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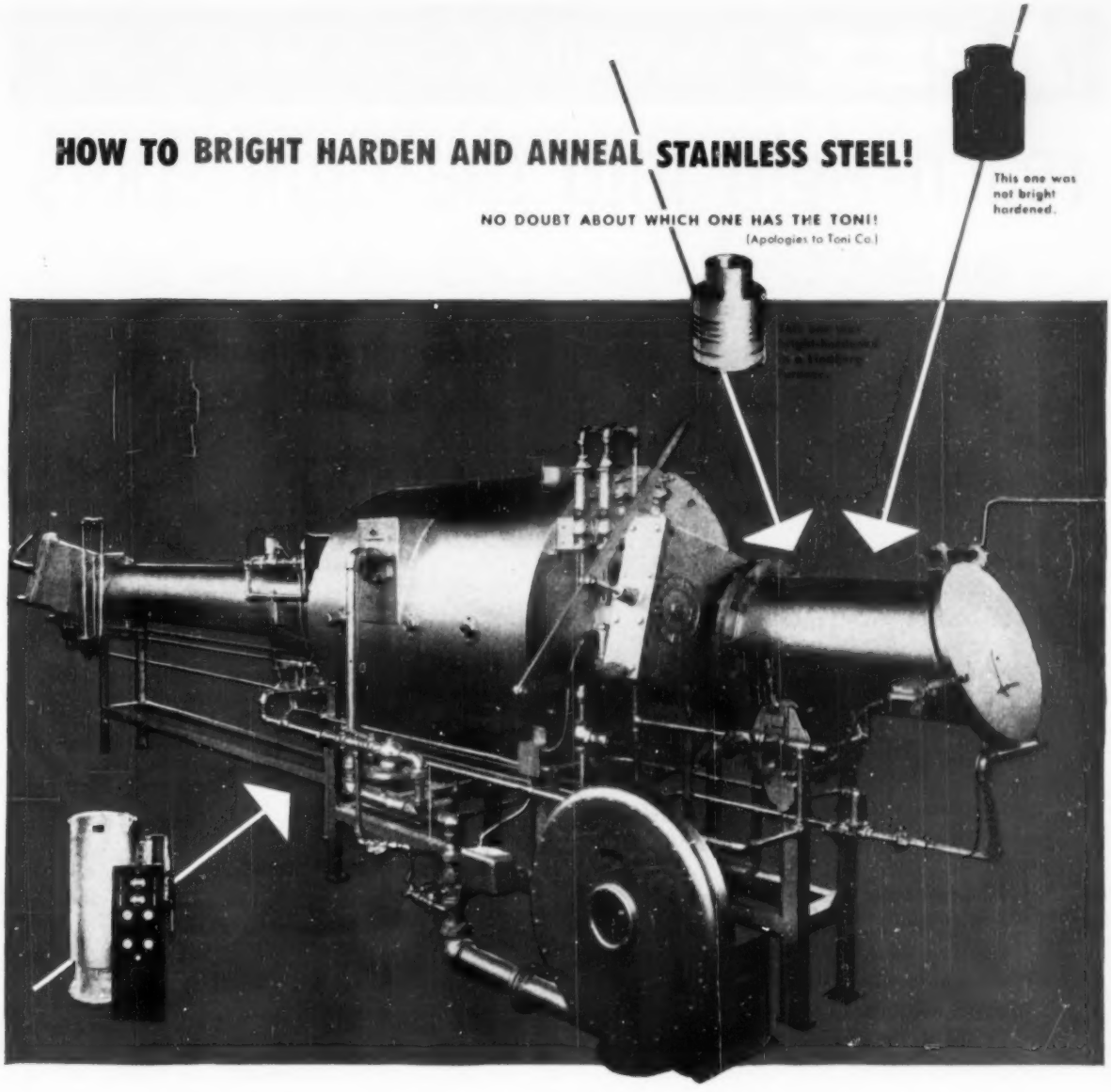

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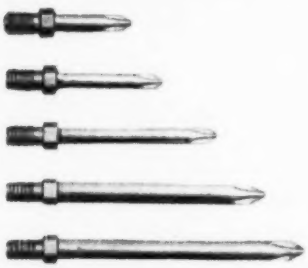
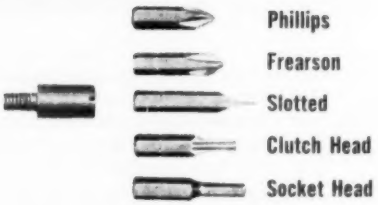


to drive SLOTTED screws

to drive CLUTCH HEAD screws

to drive HEX HEAD screws

...with APEX bit holder and insert bits



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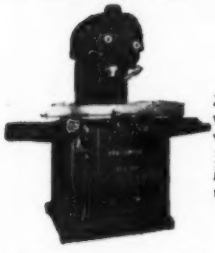
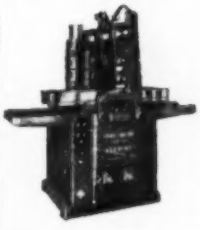


No. 2-20V
20"table travel... vertical spindle with speed range 32 to 1284 R.P.M.... 42" x 12" table.



No. 2-20DS
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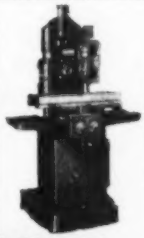

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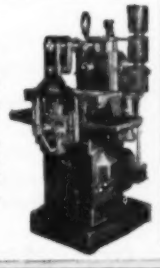

No. 1-14
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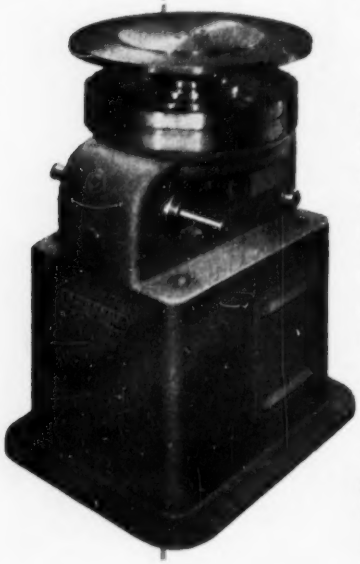

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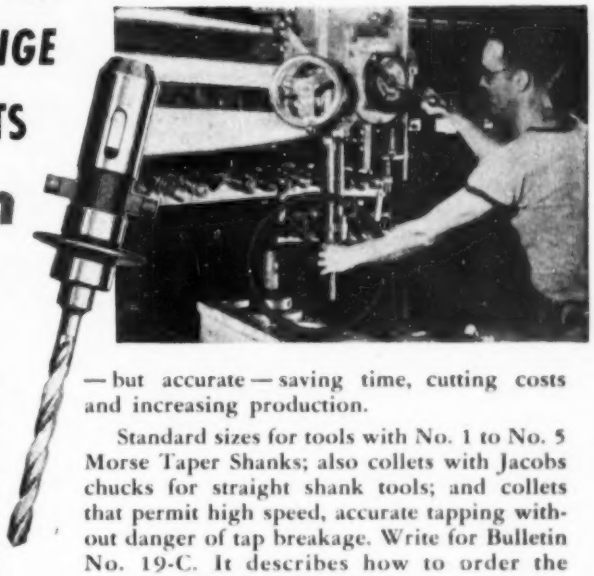
AND HOLD TOOLS CENTERED AND RIGID . . .



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Collets are locked in the chucks and disengaged easily and quickly — without stopping or even slowing down the spindle. Thus multiple tool jobs become not only continuous — but accurate — saving time, cutting costs and increasing production.

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These tool posts permit successive tools to be swung into cutting position quickly, indexed accurately, and locked rigidly, giving engine lathes many of the advantages of turret lathes. Four styles—11 sizes. Write for Bulletin 18-T.

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TOOLS

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MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

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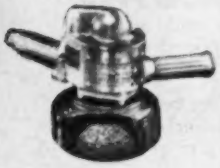

VERTICALS

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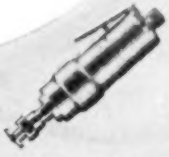

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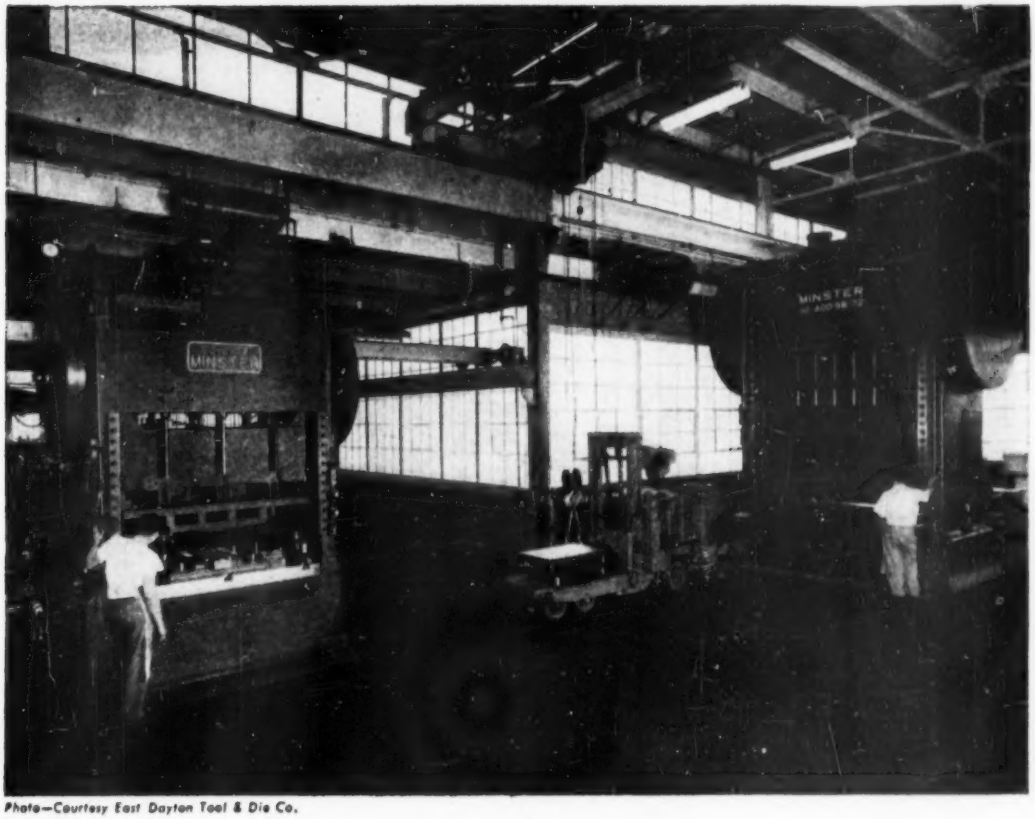

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Dayton, Ohio, one of America's greatest tool making centers, expresses an overwhelming preference for Minster presses. In all Dayton shops, large and small, 36 out of 62 presses used for try-out work are Minsters.

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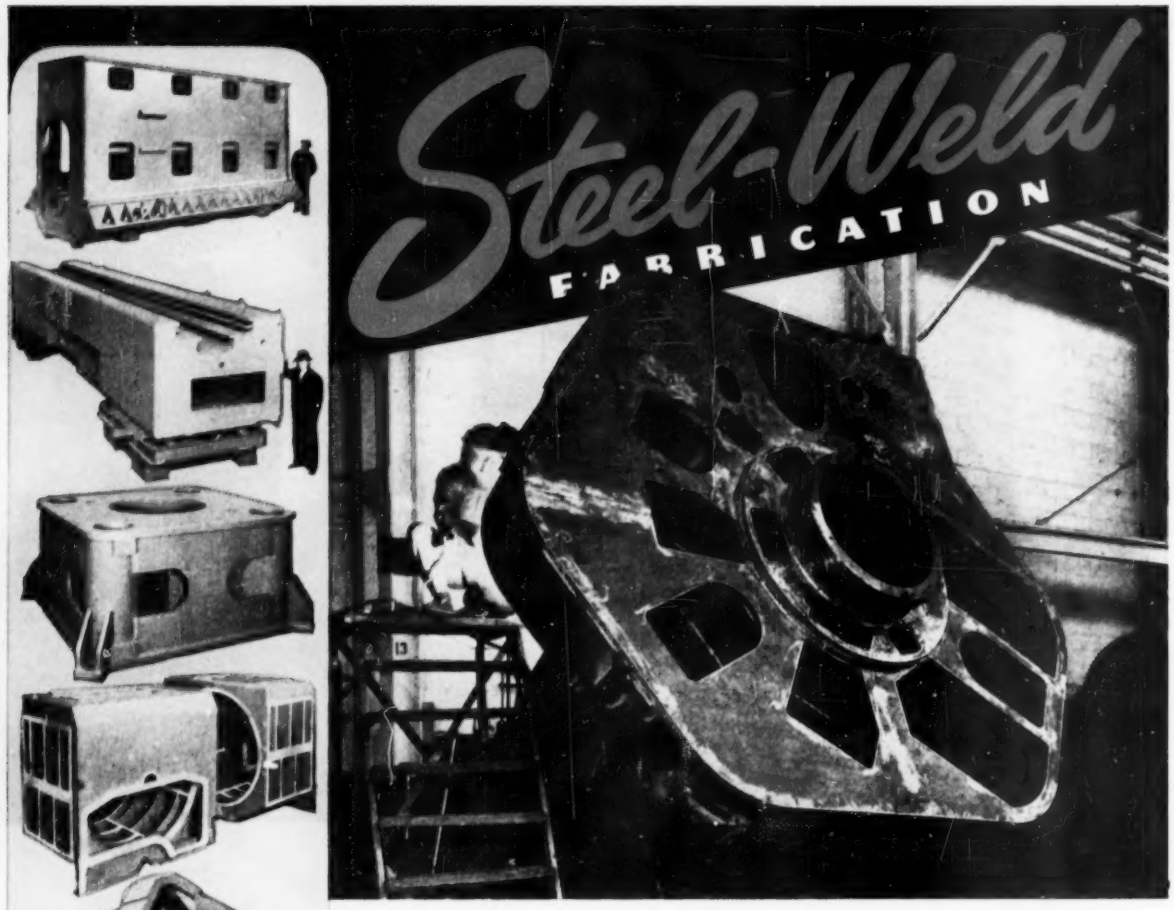

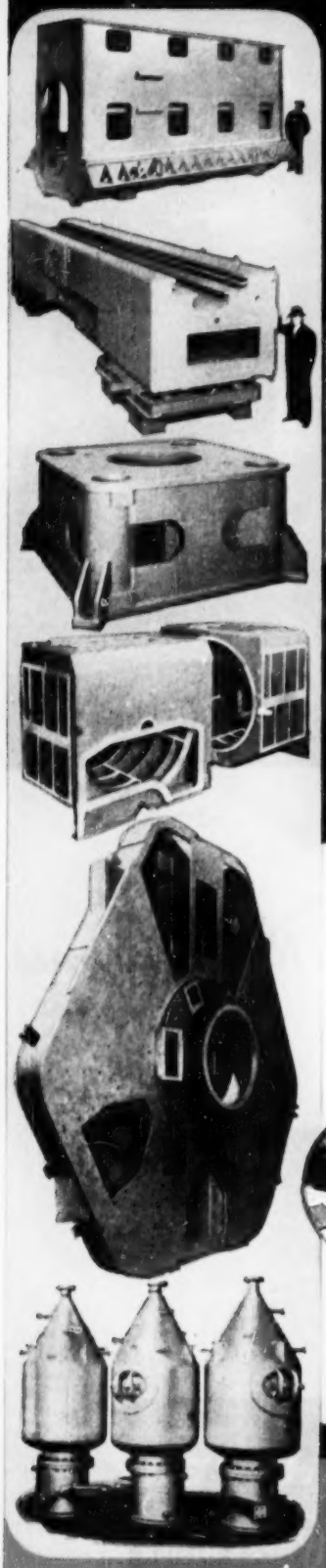

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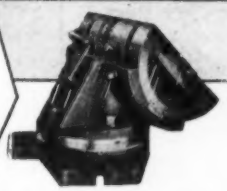

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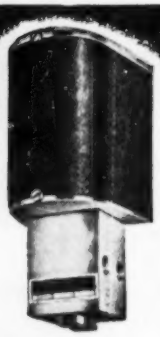

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For operating
Master Valves and
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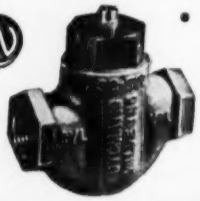

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Sizes ¼" — ⅜"
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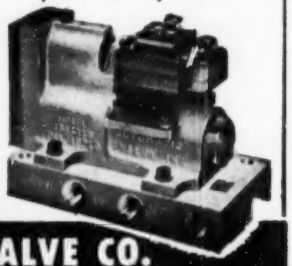

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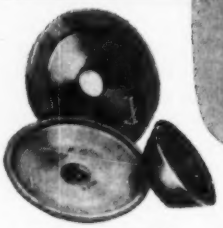

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This munitions maker says that Oakite CrysCoat HC put a heavy phosphate coating on 385,000 shells with "absolutely no trouble . . . maintenance and control are very easy."

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THIS SAVING HAS BEEN OVER $1,000 A MONTH

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WE SAVED $394 LAST MONTH . . . NOT ONE REJECT

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STEEL GEAR PLATES LOOK LIKE MIRRORS. O.C.#3 IS HERE TO STAY

This maker of aircraft instrument parts said more about our fine burnishing material: "Pinions are polished to the roots of the gears Magnesium parts are brilliant."

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☐ ALSO send me a FREE copy of your booklet *"Some good things to know about Metal Cleaning."*

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THE

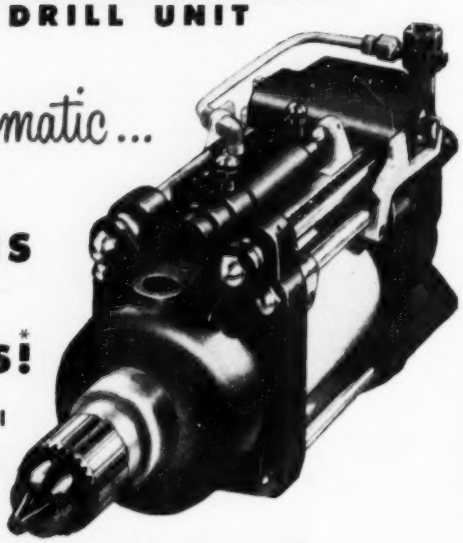
Hause Holomatic

DRILL UNIT

is fully Automatic...

-yet **WEIGHS ONLY 30 POUNDS!***

Capacity: 5/8" in Mild Steel



Air Actuated . . Hydraulic Feed

The new Model 14 Hause Holomatic Drill Unit is entirely powered by air and features hydraulic feed regulation for manual and automatic cycling. Feed rates are infinitely adjustable in both advance and retract motions. Positive stop . . . dwell . . . instantaneous retract . . . continuous cycle . . . jogging and skip drilling are easily achieved by simple adjustment for either automatic or manual operation. The Hause Holomatic can be mounted in horizontal, vertical or angular planes.

WRITE FOR THE NEW BROCHURE

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Hause **ENGINEERING**

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"ARMOR-TUF hardens tools and steel parts as easily as baking pie, and much more quickly."

Now used by leading steel processors and other manufacturers everywhere!

You can use milder, cheaper steels for many applications and machine them before hardening. The saving is two-fold: less expensive steels and lower machining costs. ARMOR-TUF gives low carbon steels the cutting and wearing properties of tool steels. You can harden the softest steels to a degree ordinarily obtainable only in high priced steels.

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As compared with the usual heat treating processes, the saving in time is great. Instead of hours, only minutes are needed. The entire hardening process takes less than ten minutes.

No CYANIDE, Absolutely—ARMOR-TUF is safe to use, contains no cyanide of any kind—there are no toxic fumes.

ARMOR-TUF IS UNCONDITIONALLY GUARANTEED TO INCREASE THE LIFE OF TOOLS AT LEAST 300%, OR YOUR FULL PURCHASE PRICE WILL BE REFUNDED.

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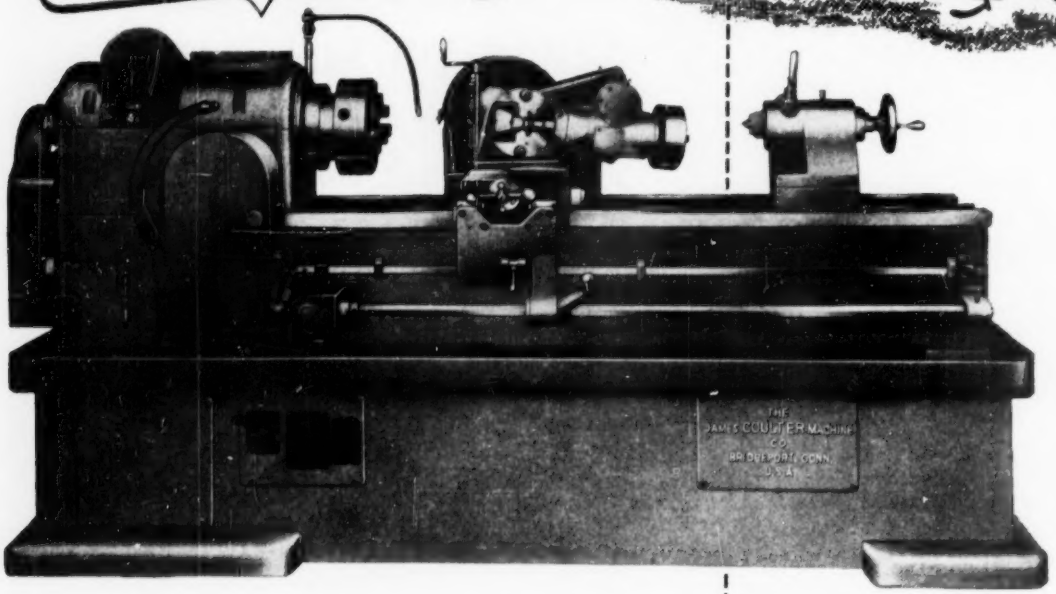
FASTER AUTOMATIC PRECISION THREADING

The only answer to high cost production blues!



Get set to sing a happy tune, for COULTER can help you banish those *"labor shortage/reject/poor production of threaded part/blues"*.

The COULTER "Threadmaster" (shown above) is one thread milling machine that can produce long and short precision traversing, elevating, crossfeed and lead screws in less time with uncanny accuracy.

Investigate COULTER AUTOMATIC THREADING MACHINES today — change the "blues" to "cheers" — extract *every cent of profit* possible out of your plant and still maintain the high quality standards you demand.

IF YOU ARE CONFRONTED with a thread production problem, our engineers can help you. Literature available.

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The *James Coulter Machine Co.*

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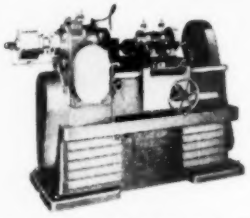
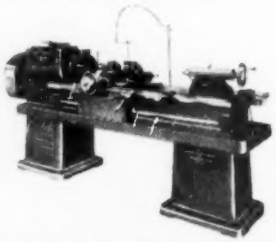


Model "H1" COULTER HOB THREADING MACHINE produces internal, external, right and left hand threads with precision — Faster — Accurately — AUTOMATICALLY.



Model "L1" COULTER THREADING LATHE produces precision, square, standard and 29 degree internal or external threads in various diameters and materials — Faster — Accurately — AUTOMATICALLY.

Select the Right Drill for Non-Ferrous Metals

from the W&B Complete Line

If you are production drilling non-ferrous metals, efficiency requires selection of proper speeds, feeds, and most of all, drills specifically applicable to the material. From the complete line of W & B drills you can select a drill for each non-ferrous metal, that is carefully designed to increase production and lower your cost per hole.

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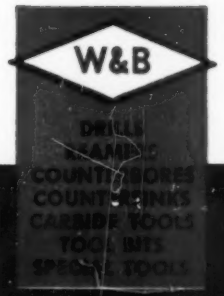
Write today on your letterhead for a free copy of the new catalog covering the complete line of W & B Drills, Reamers, Countersinks, Counterbores, Carbide Tools, Tool Bits and Special Tools.



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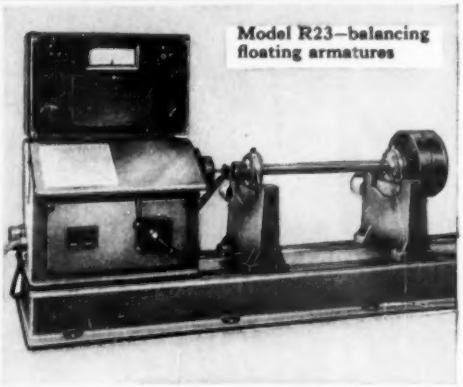
WITH

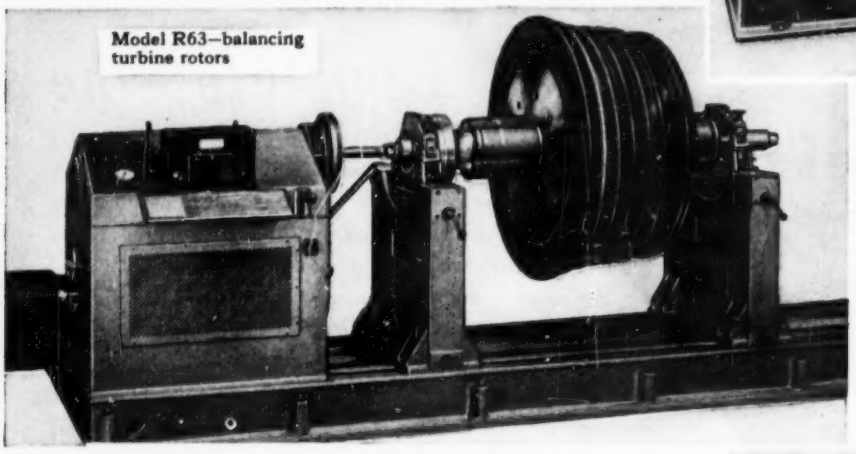
SCHENCK

ELECTRO-DYNAMIC BALANCING MACHINES

Now, in a fraction of a minute and in a single run, you can accurately determine the amount and location of dynamic and static unbalance on rotating parts. The SCHENCK Electro-Dynamic Balancing Machine has a sensitive and accurate electrical measuring system—without electronic tubes or oscillograph—that will indicate unbalances caused by displacements as little as 0.00004" from the center of gravity. Simple and easy to operate, the SCHENCK Balancer, by coordinate measurement, quickly indicates on a Wattmeter the unbalance of the rotating part.



Model R23—balancing floating armatures



Model R63—balancing turbine rotors

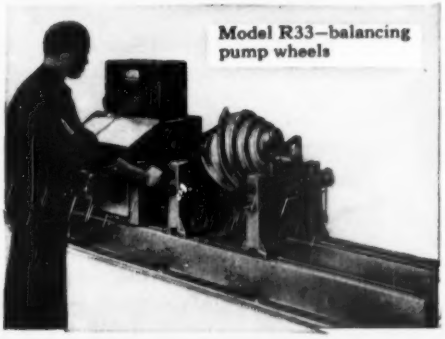
The workpiece is balanced easily by adding or removing weight units at two of the four balancing points located within the coordinates, 90 degrees apart. For many production installations, Schenck Balancers combined with machine tools—check, correct and inspect parts in one set-up.

SCHENCK ELECTRO-DYNAMIC BALANCING MACHINES ARE THE RESULT OF 40 YEARS WORLD-WIDE EXPERIENCE. THEY ARE MADE IN MANY CAPACITIES TO BALANCE ROTATING PARTS WEIGHING UP TO 100 TONS.

Machine Type	R13	R23	R33	R43	R53
Measuring Range (Weight of part in lbs.)	.1-22	.3-66	1-220	3-660	11-2,200

Machine Type	R63	R73	R83	R93
Measuring Range (Weight of part in lbs.)	33-6,600	110-22,000	330-66,000	1100-220,000

Let Cosa Engineers recommend the proper Schenck Balancer for your needs. Or, send for detailed catalog.



Model R33—balancing pump wheels

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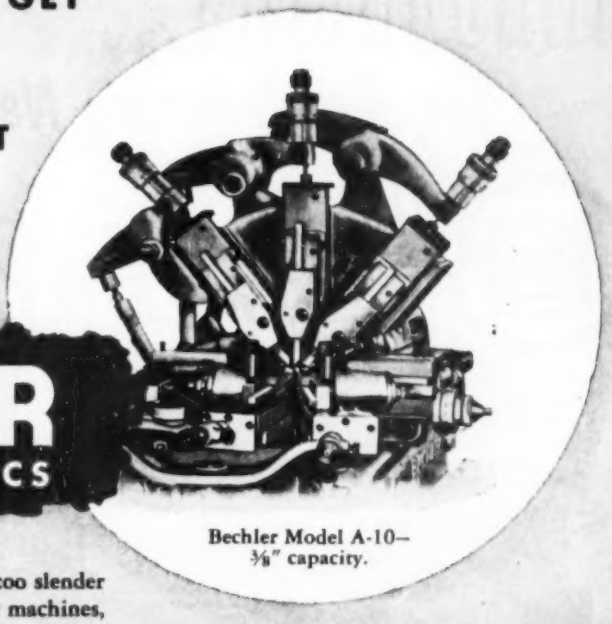
BECHLER SWISS AUTOMATICS



Bechler Model A-10—
⅜" capacity.

When tolerances are too tight, and parts are too slender or intricate to be produced on ordinary screw machines, then Bechler genuine Swiss Automatics are probably what you need. Fifty years of experience have made Bechler the leading builders of Swiss type Automatics—and BECHLERS are SWISS-MADE.

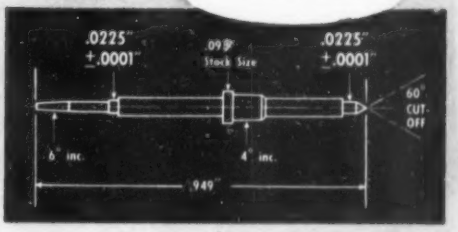
Bechlers do the job quickly, accurately, uniformly, and with exceptionally high finish. Five tool slides, with single-point tools, can be individually adjusted with micrometer screws. The two horizontal slides of the double tool attachment are used for undercutting and burnishing. Different models are available with capacities up to 1¼" diameter and 9" turning length.

Get in touch with us soon. Find out how Bechler can help you make better products to meet and beat higher and higher standards.

- **Service centers in New York and Los Angeles—factory trained men will plan layouts, produce tools, cams, and make set-ups.**
- **Complete stock of attachments, spare parts, and cams.**

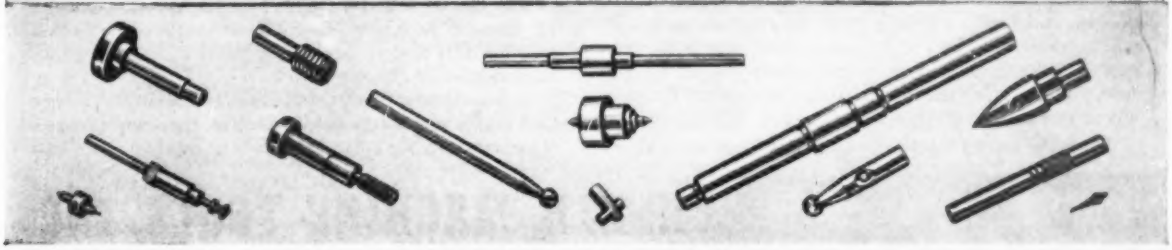
INDICATOR SHAFT

Actual size



material	stainless steel, type 303
precision	bearing diameters held to ± .0001"
finish on bearing surfaces	6 MIRMS
production time	30 seconds per piece
machine	Bechler, Model A-10

The Bechler Model A-10 can produce many different precision parts up to ⅜" dia., 2¾" long. Here are just a few, actual size:



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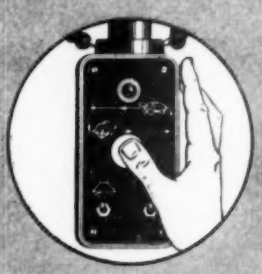
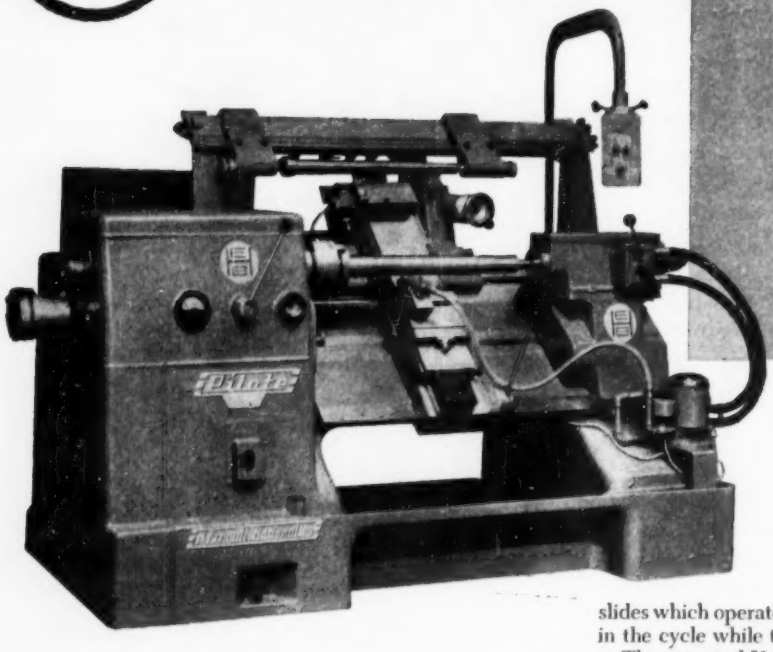
The Revolutionary New

Pilote

COMPLETELY AUTOMATIC

HYDRAULIC COPYING LATHE





- **Spindle speeds up to 3000 RPM.**
- **Front and rear tool slides are standard.**
- **Vertical infeed tool slides optional.**
- **Coolant system prevents distortion; permits highest speeds.**
- **Equally suitable for bar or chucking work.**

Ushering in a new era in metal working, the new H.E.B. PILOTE is the first completely automatic copying lathe. The operator has only to load the machine and *press a button* to start the cycle. When the part is finished the tool returns to its starting position, and the spindle stops automatically!

At the touch of a button the front tool will take one or more roughing cuts over any necessary parts of the component, and finally, a finishing cut. Any narrow undercuts will automatically be cut by one or more rear tools, thus enabling the front tool to be sufficiently rugged to take heavy cuts . . . The rear tool may also be used for finishing any diameters requiring a micro-finish.

The lathe can be supplied with one or more vertical tool slides which operate automatically at predetermined points in the cycle while the front tool is also cutting.

The patented H.E.B. hydraulic feed results in improved surface finish, and also simplifies setting up as there are no mechanical parts to adjust. By the design of the system, the feed per spindle revolution will remain exactly as set, regardless of the resistance met by the tool or variations in spindle speed.

The new PILOTE produces work unbelievably fast, accurately, and with a better finish . . . Yet setup time and tooling costs are slashed dynamically. Motors up to 60 H.P. permit metal to be removed at a terrific rate.

The new H.E.B. PILOTE is the latest achievement of H. Ernault Batnignolles – France's century-old machine tool builders and specialists for years in the design and manufacture of *copying lathes!*

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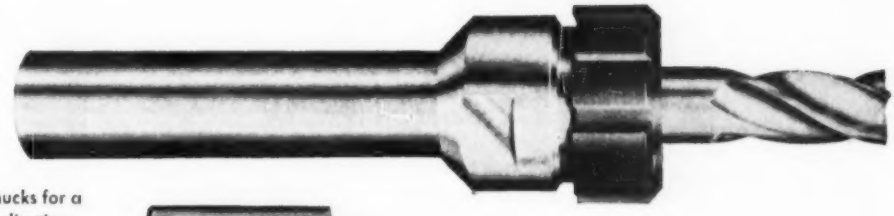
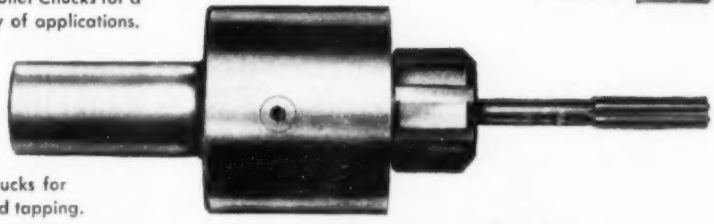
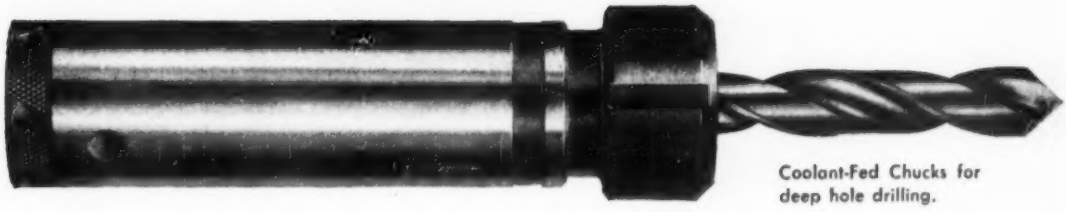
- precision manufacturing assures tools running true.
- sizes from 1/16" to 1½", shanks to fit any type machine.



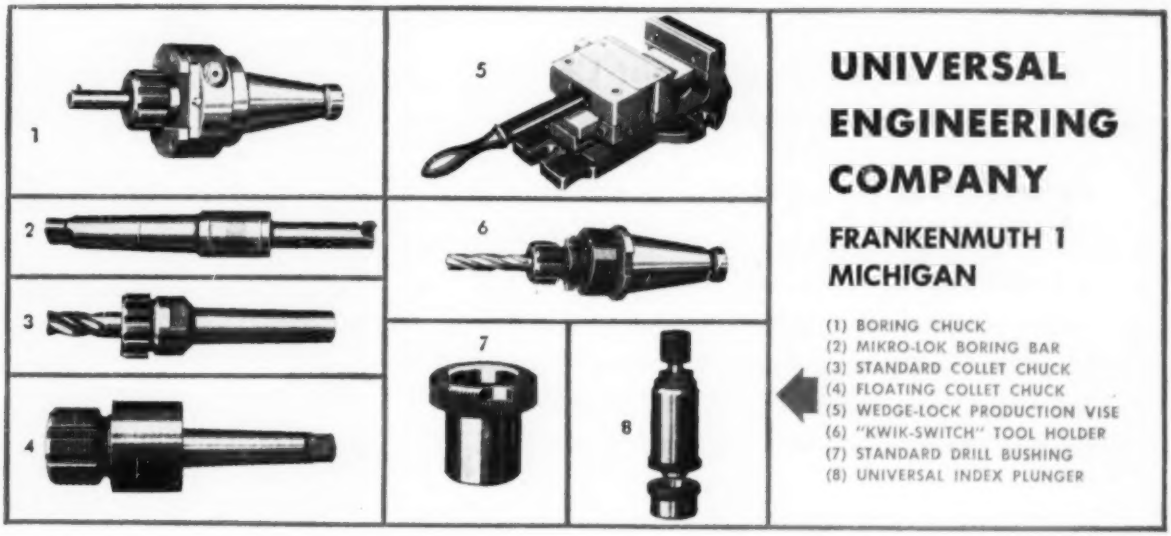
Standard Collet Chucks for a wide variety of applications.



Floating Chucks for reaming and tapping.



Coolant-Fed Chucks for deep hole drilling.



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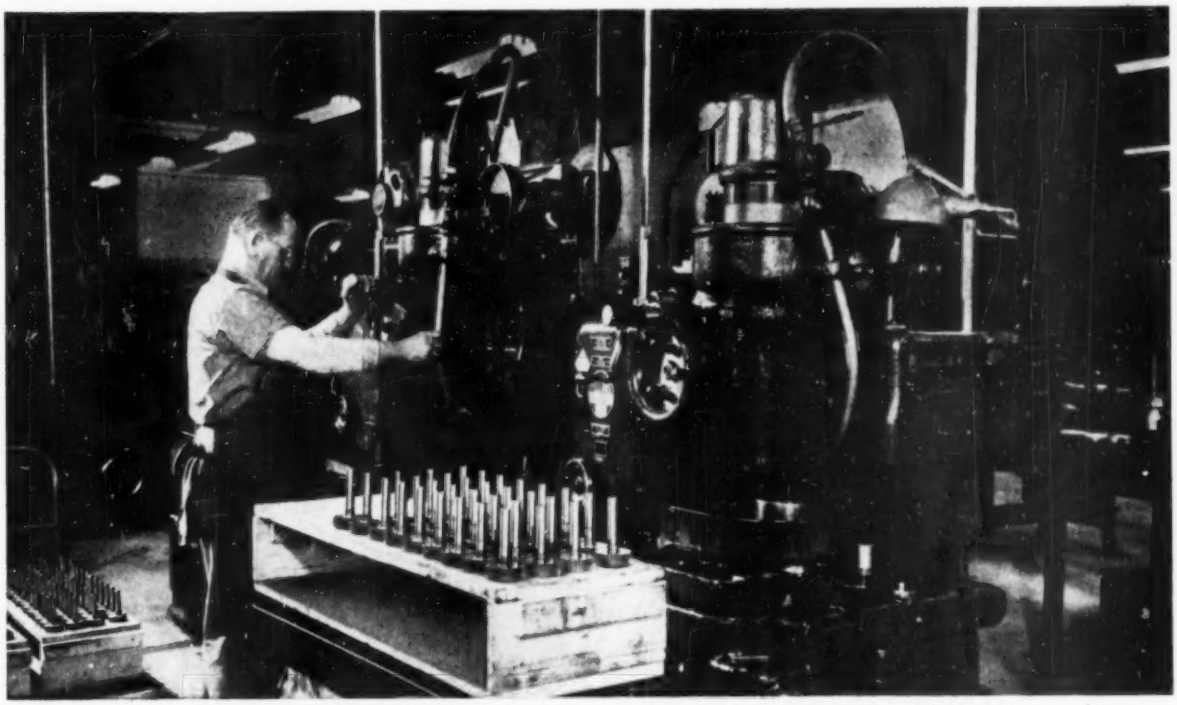
"No doubt about it... Sinclair saves us money"

.. says W. P. St. John, Owner, Radax Manufacturing Co., Rochelle Park, N. J.



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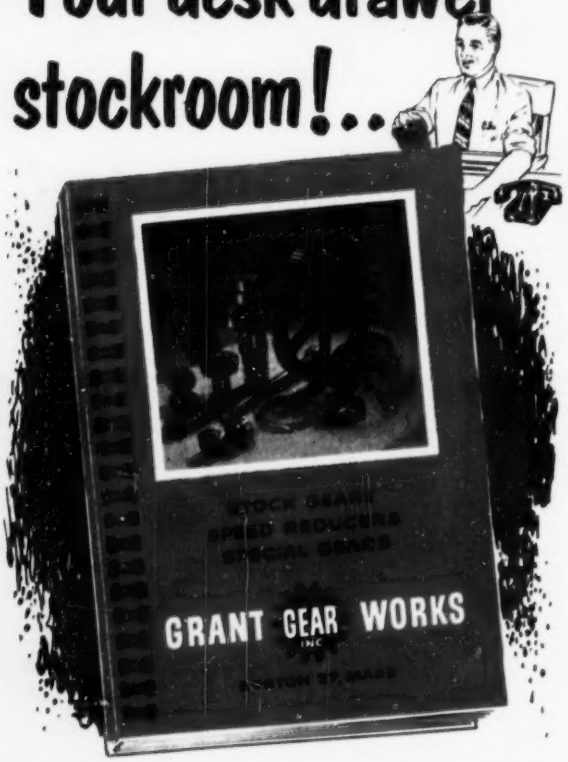

Yes, you can keep your stock of gears right in your desk drawer. It's simple with the new Grant catalog. There's no need of *carrying* a large inventory of gears *on hand* when you can find what you need at Grant—with delivery made to fit your schedule.

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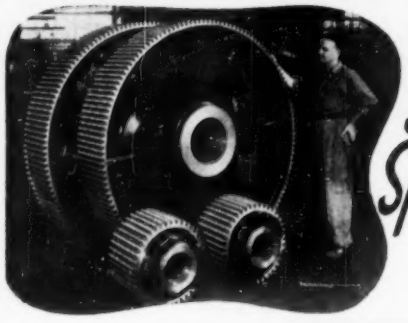

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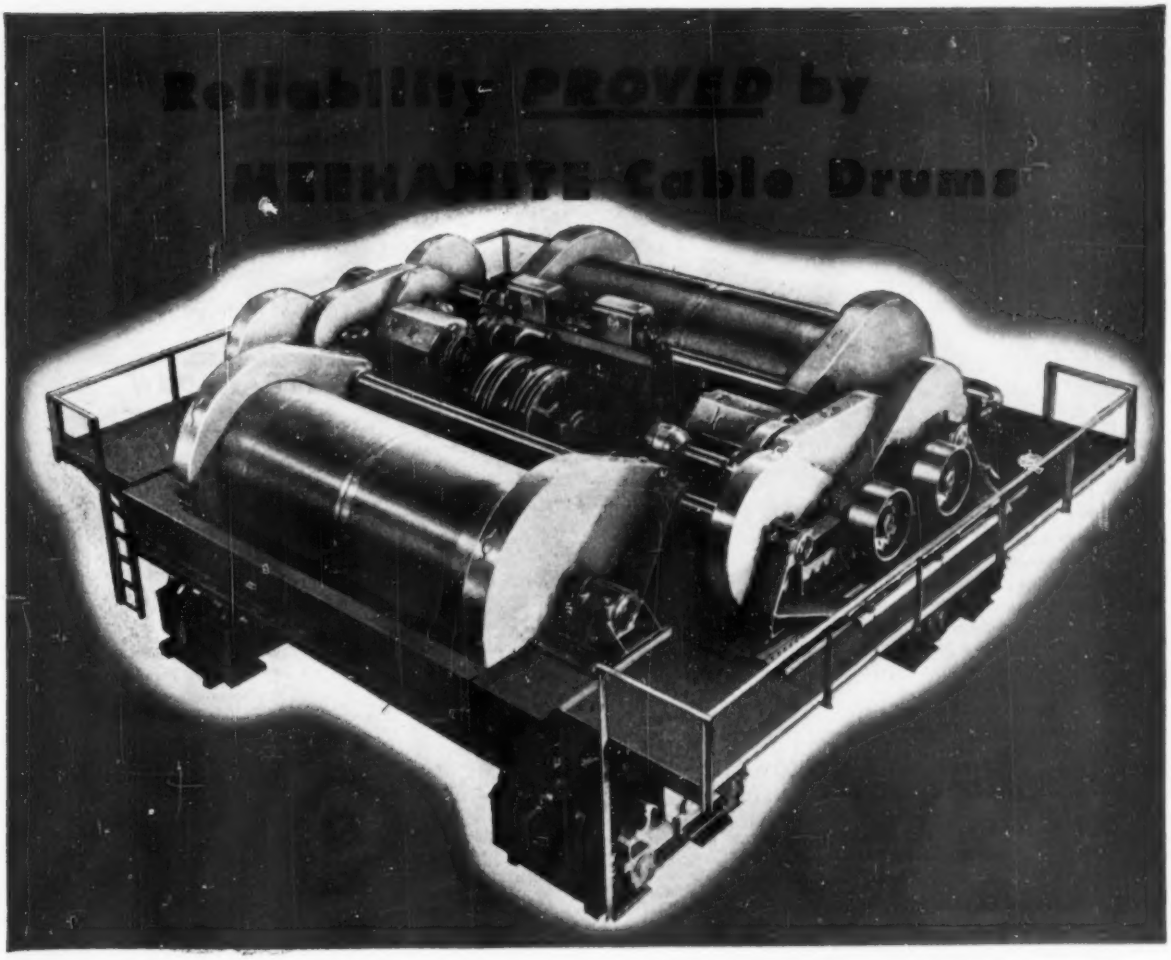

HERE is another example of the rapid growth of engineering understanding of the reliability of Meehanite metal in component applications once believed beyond the possibilities of iron castings.

Illustrated is the main trolley for a 250 ton capacity crane built with Meehanite cable drums. The 4 drums required each weighed 14,500 lb., were 8 feet 4 inches long,—had a diameter of 62 inches. Such drums are not an experiment, but are among hundreds of similar units used by the industry because they have established exceptional service records.

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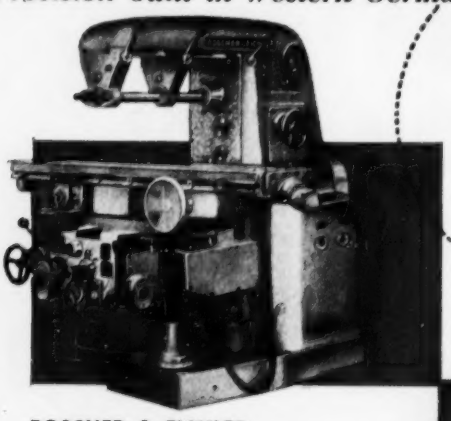

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- Reciprocal milling and automatic spindle stop when in rapid traverse.
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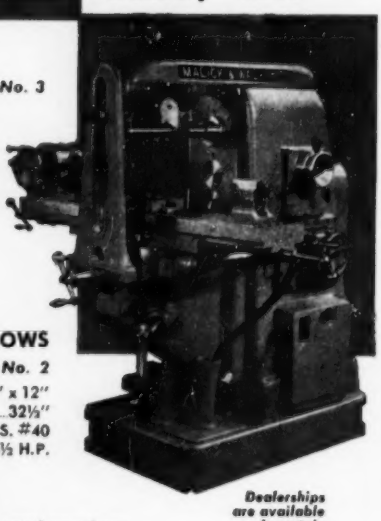
- Working surface 63" x 14".
- Longitudinal travel 48".
- Motor on spindle 11 HP.



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Longitudinal travel	32½"
Working spindle	N.S. #40
Motor	5½ H.P.

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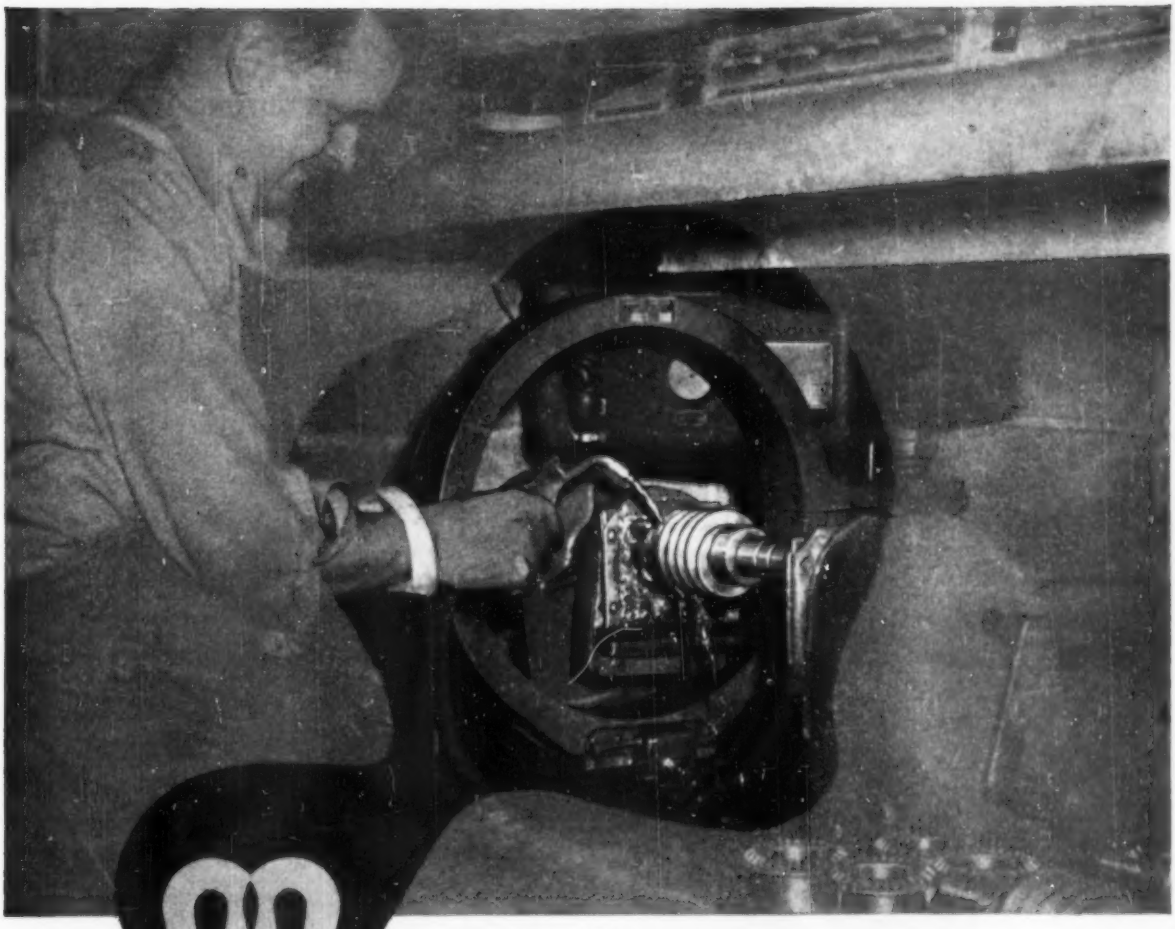
PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.



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The inspection with Magnaflux detects hidden defects in the structure of metals. As applied to the manufacture of BRAD FOOTE gears, Magnaflux will point out the presence of even a minute, embedded imperfection that would prevent the gear or pinion from giving the ultimate service.

- Magnafluxing is one of a series of tests and controls employed by BRAD FOOTE. It helps to perpetuate the high quality which is traditional in gears made by BRAD FOOTE. It is another reason why you can order with confidence that the gears you receive will give you complete satisfaction.
- BRAD FOOTE makes all types of gears and pinions, and many styles of gearmotors, reducers, and transmissions. Our engineering staff will work with you on the design of any special gear or assembly you may need for your shop—or for use on equipment you make to sell.
- The complete facilities of the BRAD FOOTE organization are available whether you need one or scheduled quantities. We believe you will find satisfaction in working with us. Consider sending us your next inquiry which will receive prompt attention.

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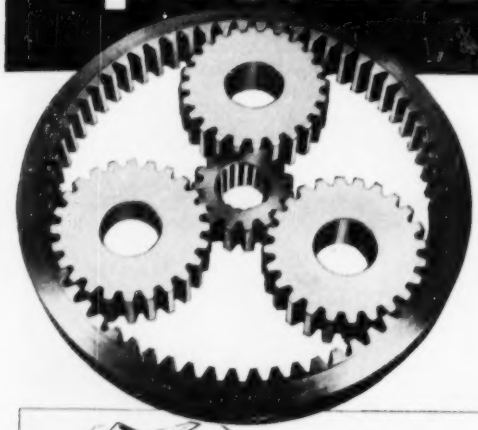
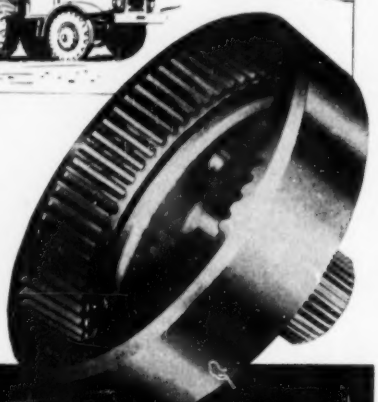


Photo shows planetary gear system assembled.

Pictured above is Euclid Road Machinery's immense 25 or 40 ton coal hauling equipment using planetary gears.

Photo at right shows an alternate design of the sturdy planetary gear carrier.



Standardize

GEARS OHIO REDUCERS

Ohio Gears are at work in all their glory when operating for Euclid Road Machinery, world's leading manufacturer of heavy duty coal haulers and earth moving equipment. Here's where gear engineering, strength and durability meets its test, on long hauls, up and down steep grades, forward and backward over broken terrain, at any angle, pushing and pulling 25 or 40 ton loads on 4 wheel planetary gear drives, at various speeds, tensions and stresses. All this on Ohio Gears, every day, year in and year out, with engineering in every ounce of metal and every measurable gear dimension . . . Euclid Road Machinery demands dependable gears. Perhaps your products need such mechanical insurance. See our nearest distributor or write direct.

ESTABLISHED 1915

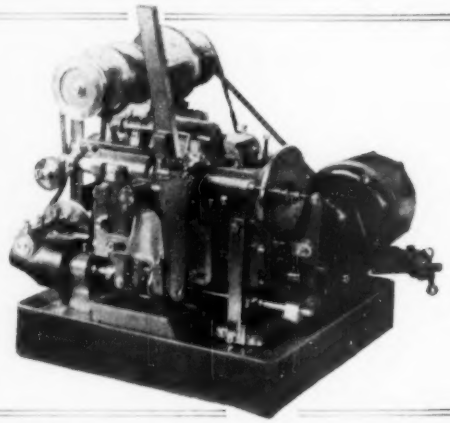
THE OHIO GEAR COMPANY

1326 E. 179th St. • Cleveland 10, Ohio

OHIO GEARS

WALTHAM

PINION AND GEAR CUTTING MACHINES



Fast, Convenient, Compact, Accurate

Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

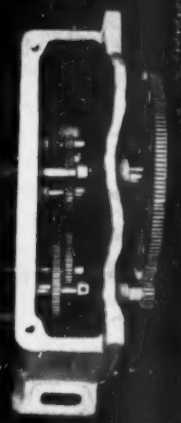
Send for detailed information and complete specifications.

WALTHAM MACHINE WORKS

High Street, Waltham, Mass.

GEARS

IN QUANTITY PRODUCTION

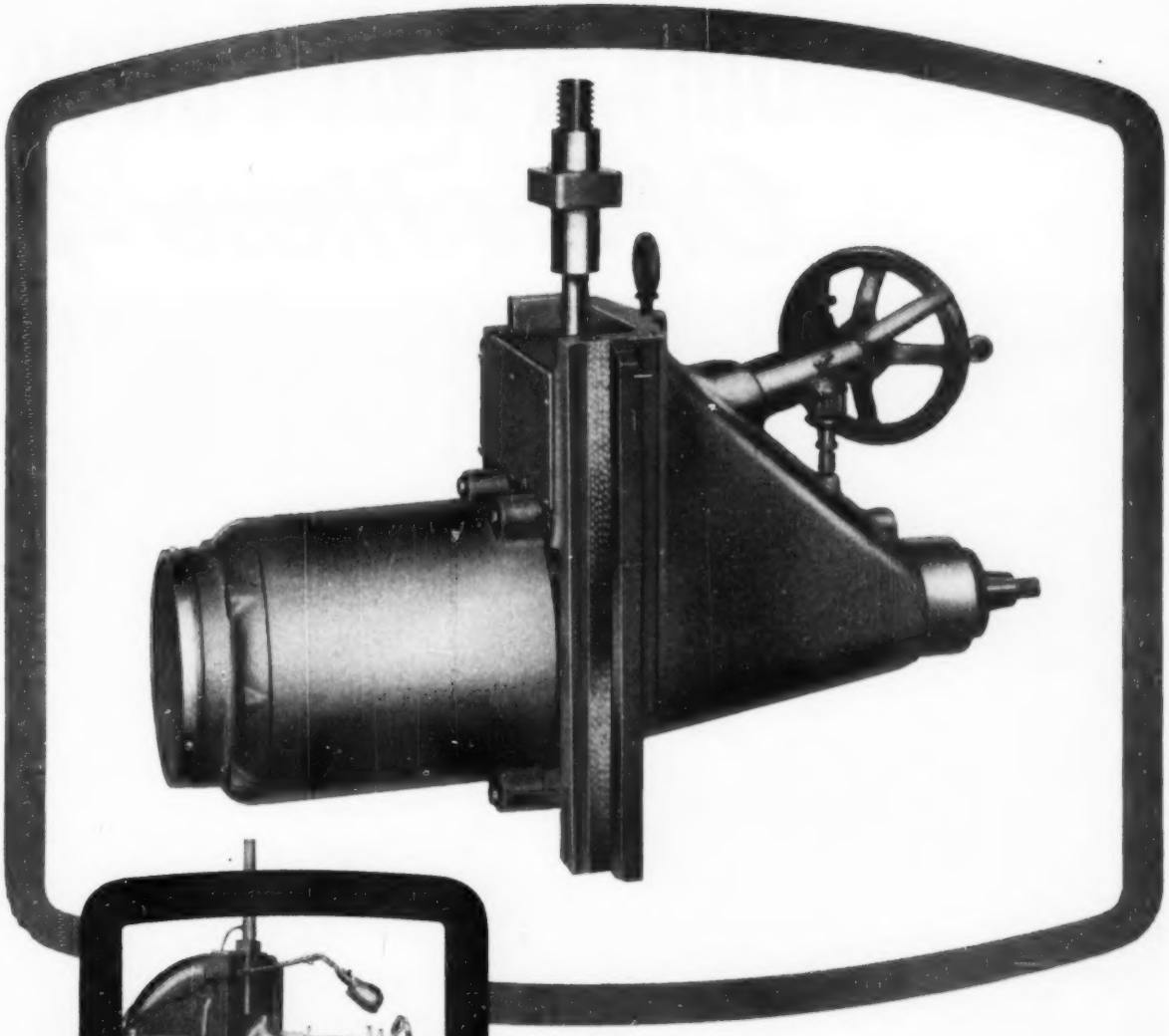


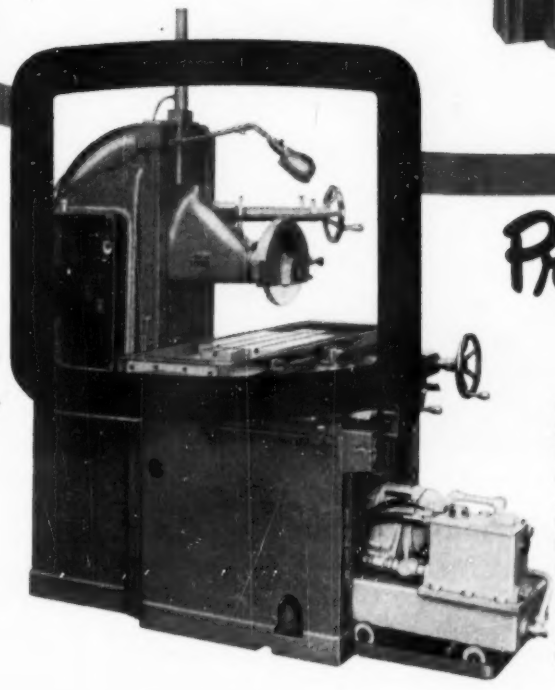
Territories Available for Sales Representatives

for manufacturers. A complete plant with over 100 machines in continuous production.

ACME GEAR COMPANY

5-17 47th ROAD, LONG ISLAND CITY 1, N. Y.





Precision in a Package

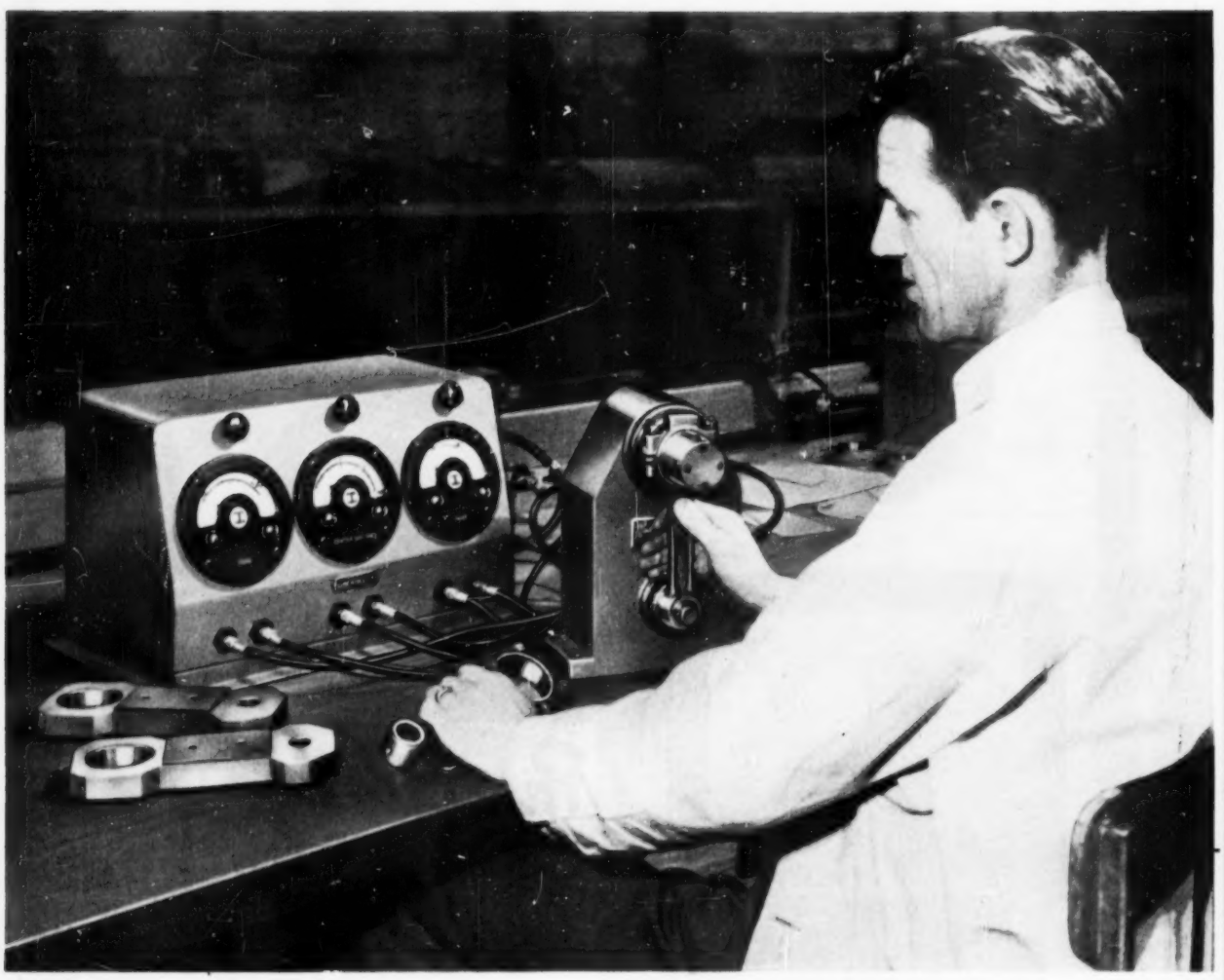
Here's the motorized spindle of the 1218 HYDRABRASIVE SURFACE GRINDER — the last word in hydraulically operated grinders. This piece of packaged precision delivers 3 HP direct to the 12" grinding wheel . . . for taking heavy cuts, for producing fine finishes, for maintaining the ultimate in flatness on every job. No. 1218 specifications include: wide cross travel (12") and moderate table length (18"); saddle ball ways; wide range of table speeds; accessories for wet or dry grinding. Send for latest complete catalog. Abrasive Machine Tool Company, 8 Dunellen Road, East Providence 14, Rhode Island.

Abrasive Quality is Reflected in the Finish of Your Product

ABRASIVE

ACCURACY BOOSTS PRODUCTION

Only a Taft-Peirce *Offers these 4*



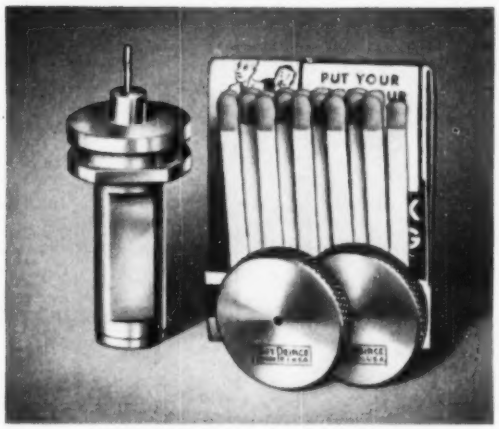
1 Computes Difficult Measurements Automatically

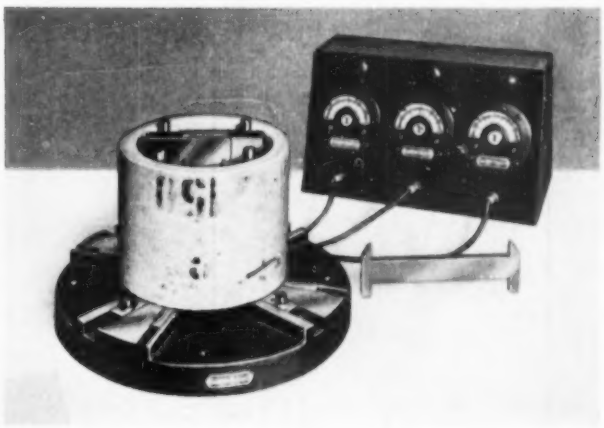
A T-P Computing CompAIRator eliminates the need for two measurements and a calculation. One gage, one dial, measures, calculates and indicates the final answer instantly on the dial face, for such difficult measurements as center distance without respect to hole size, deviation from angle or taper, concentricity, and squareness of bore to face.

The three dial Computing CompAIRator pictured above does the work of six dials in checking bend, twist, and center distance of connecting rods.

THE TAFT-PEIRCE MANUFACTURING

CompAIRator Air Gage
Great Features



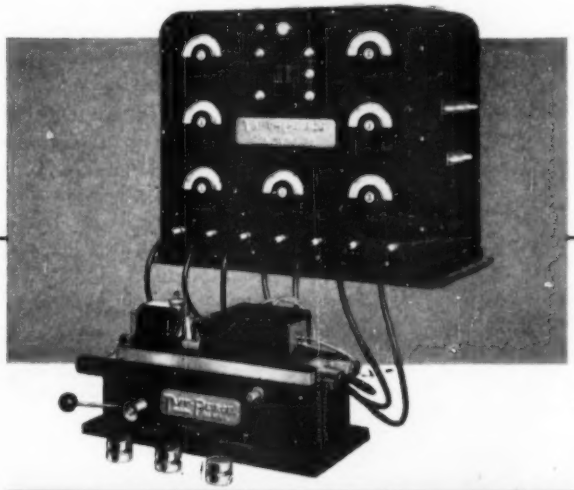


2 Checks Diameters as small as .055″

The velocity-type circuit of a T-P CompAIRator, which permits use of tiny air passages and nozzles, makes these small measurements possible quickly and accurately.

3 Checks Tolerances up to 120 thousandths

T-P CompAIRator air-contact members can be furnished to permit measurements within this wider tolerance range with a standard unit.



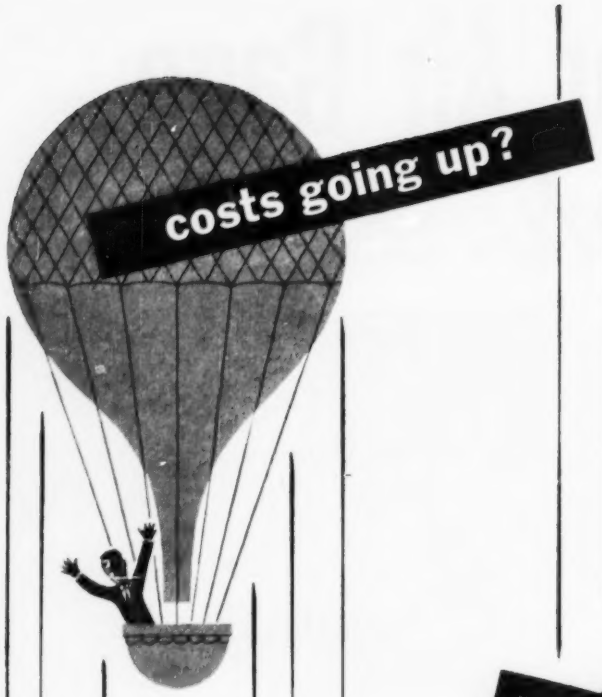
4 Gives Simultaneous Signal Light and Dial Indications

A T-P Air-Electric CompAIRator offers the ultimate in speed for multi-dimensional gaging. It provides both exact size on standard dials *and* light indications for oversize, undersize, and within tolerance conditions.

Couple these great features with the greater speed, accuracy, and dependability of a T-P CompAIRator — and you know why thousands use and prefer them. Write for demonstration at your plant. Prove the time and money saving differences for yourself.

T P *T-P means Top Precision*

COMPANY, WOONSOCKET, RHODE ISLAND

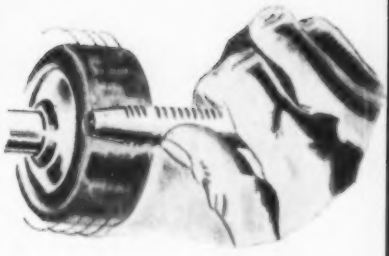


GEROTOR

HYDRAULIC PUMPS

A well-designed hydraulic circuit can help bring soaring costs down to earth . . . in your product, in your plant. The best-designed hydraulic circuits are built around Gerotor pumps . . . for high efficiency, longer life, less slippage, more uniform flow. Engineered for pressures up to 1000 p.s.i. continuous duty; in some sizes, up to 1200 p.s.i. continuous, 1500 intermittent. Deliveries from .4 g.p.m. at 1800 r.p.m. to 40 at 1200 r.p.m. Specify Gerotor!

GEROTOR MAY CORP., BOX 86, BALTIMORE 3, MARYLAND



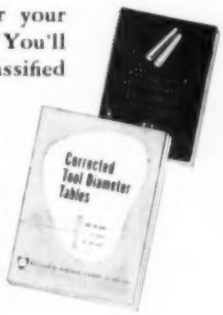
Mechanical Finishes

. . . polished, buffed, scratchbrushed, burnished.

Aluminum screw machine parts take all finishes

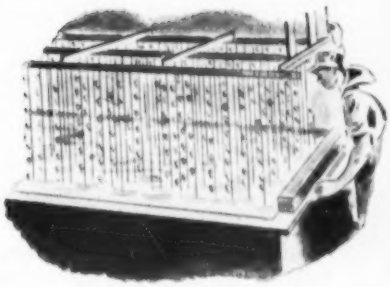
Add to low cost and ease of machining another advantage of aluminum screw machine stock . . . better finishes. Fittings and fasteners are often anodized to increase their resistance to corrosion and abrasion. Component parts for appliances are frequently plated for high luster and better match with other parts. Burnishing is usually used for bulk finishing of small parts such as smoking pipe parts. Finishes can be applied to aluminum by most mechanical and chemical processes. Aluminum can be painted and electroplated using standard equipment and procedures. And, of course, it can be anodized to any color of the rainbow.

Your local Alcoa sales engineer will answer your questions on finishing and machining procedures. You'll find him listed under "Aluminum" in your classified phone book. Aluminum Company of America, 871-J Alcoa Building, Pittsburgh 19, Pa.



ALCOA OFFERS TWO BOOKS—*Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques.

Corrected Tool Diameter Tables—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

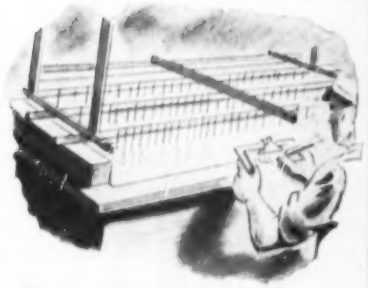


Chemical and Electrochemical Finishes

. . . frosted, etched and anodized for unusual effects in color—for extra corrosion resistance—for better paint adhesion.

BASIC ECONOMICS FOR BUYERS

While you buy screw machine stock by the pound, you machine it by the foot. A pound of aluminum gives you three times more feet of stock than a pound of brass or steel.



Electroplated Finishes

. . . chromium, copper, nickel, gold, silver and brass.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

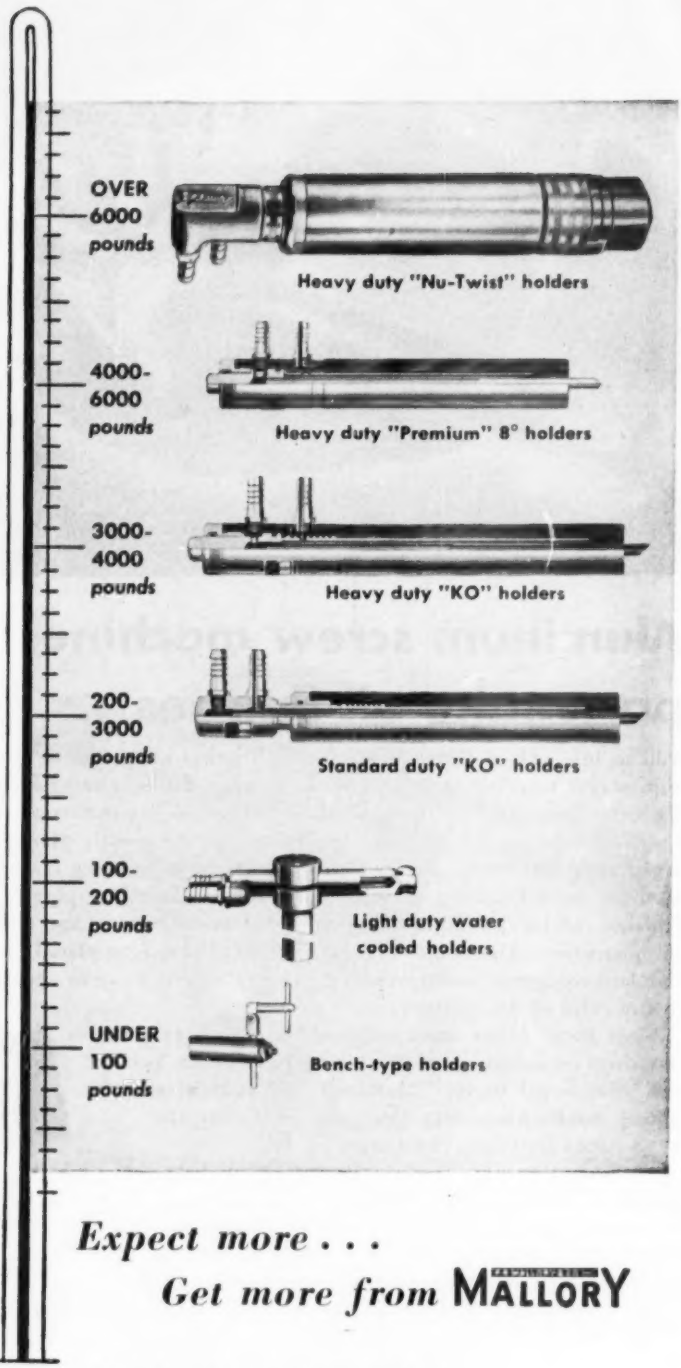
You Name The Welding Pressure . . . .

Mallory has the holders and electrodes in stock

Resistance welding pressures from under 100 pounds to over 6,000 pounds can be handled by standard Mallory holders and electrodes . . . available from stock. The new Mallory "Nu-Twist"* holders and electrodes will perform in the high pressure ranges needed for welds to meet all present military specifications . . . as well as the most demanding commercial requirements.

Because holders and electrodes are available in a wide variety of shapes and sizes, standard units can be combined to handle practically any resistance welding job without the cost or delay of special designs.

Like to see our complete line? Then write to us, or have your Mallory distributor drop by with a copy of Catalog 550C. See for yourself the complete range of holders, electrodes and accessories that are on the shelf for immediate delivery.



Expect more . . .
Get more from MALLORY

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

RESISTANCE WELDING ELECTRODES, HOLDERS, RODS AND BARS, DIES, CASTINGS, FORGINGS

*Trade Mark; Patent Applied For

P.R. MALLORY & CO. Inc
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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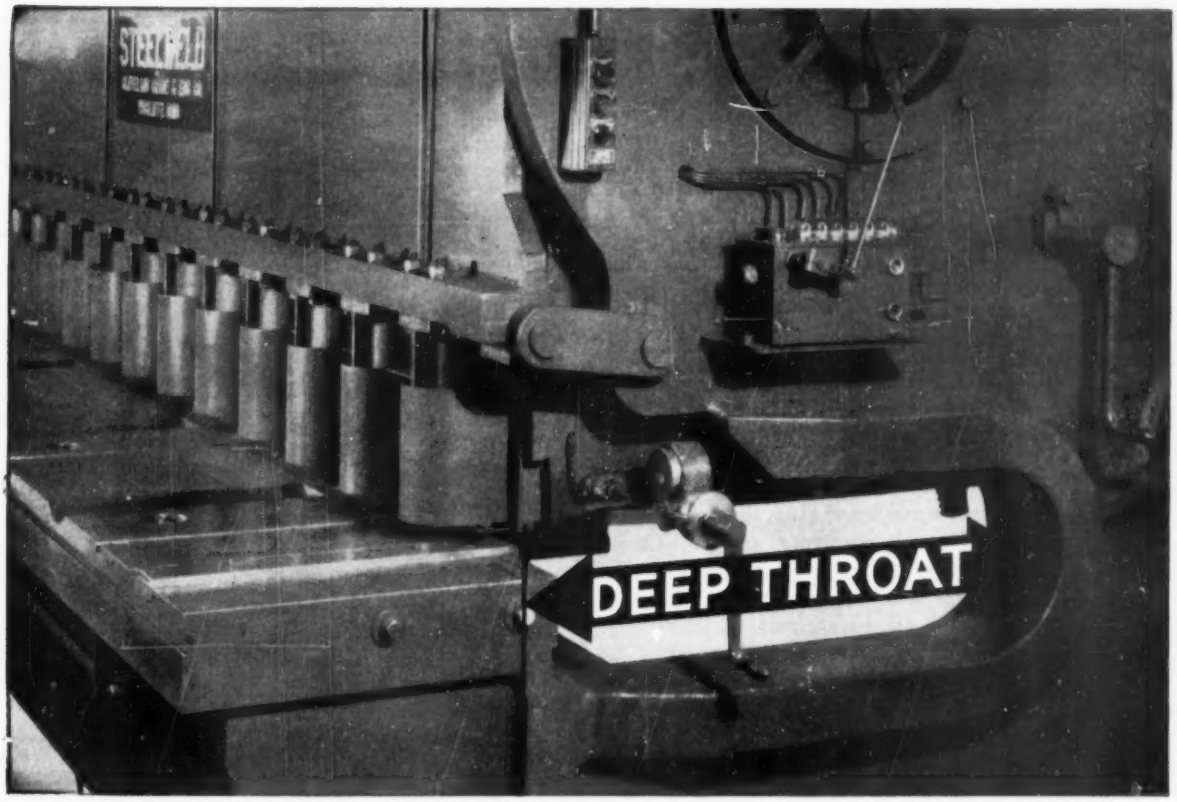
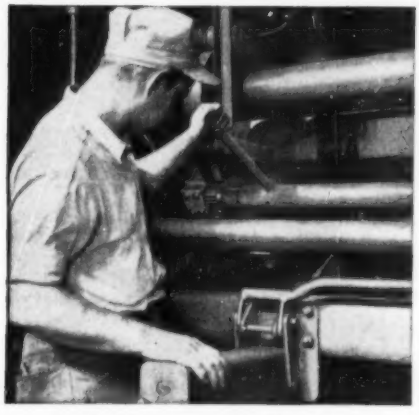
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



WIDE SHEETS EASILY SLIT



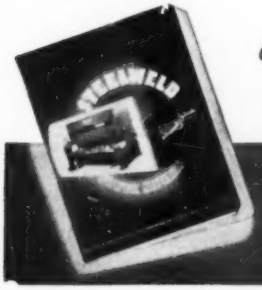
Steelweld Shears are built for thicknesses of 10 gauge to 1¼ inch and for lengths of 6 to 20 feet.

Throat depths of 24 and 36 inches make it easy to slit wide sheets on Steelweld Pivoted-Blade Shears. Twenty-four inches is the standard throat depth for all machines. Thirty-six inch throats can be provided as a special feature for many of the larger size machines.

With such deep throats it is possible to slit plates of 48" to 72" wide down the middle for any length.

It is a simple matter to adjust the blade for slitting. The easily-reached slitting adjustment shaft is turned by a spanner wrench as illustrated. When adjustment has been completed a locking devise holds it securely in position.

Steelweld Shears are loaded with exclusive features that make operation easier and speed production. There are no other shears like them.



GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1423 EAST 282nd ST. *WICKLIFFE, OHIO*

STEELWELD PIVOTED BLADE SHEARS

hendey lathes are better built...

FOR LONGER, MORE ACCURATE LIFE!

And here's how it's done — Hendey starts with quality design and follows through with quality workmanship. Take the hardened and precision ground bed ways, for instance. Hendey does this differently *and better!* First, the world's most modern induction hardening equipment uniformly hardens the ways. Next, the precision machined legs and chip pan are attached to the bed (and they are never removed thereafter). Ultra precision grinding follows. Exacting checks for accuracy are then followed by electronic testing for hardness — uniform hardness — there are no soft spots in a Hendey bed — and a customer's test sheet proves it!

Add to this, quiet headstocks, the finest of lead screws, simplified, convenient controls and the ruggedness and power essential for modern precision turning.

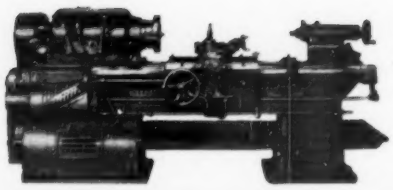
Hendey lathes maintain the Hendey tradition for quality and accuracy. And there is the *right* machine in the Hendey line to suit your precision turning requirements. Write for details.

Featuring uniformly hardened and precision ground bed ways.

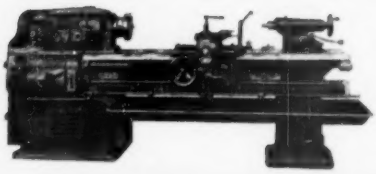
HENDEY

the Hendey machine co., inc.
torrington, conn., u.s.a.
——precision machine tools——

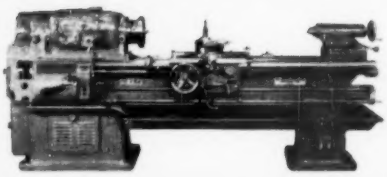
distributors in principal cities



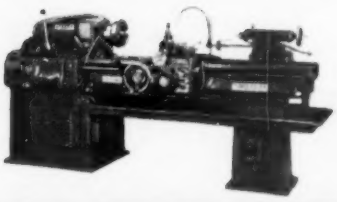
18" — 20" — 24" 12-speed Geared Head Lathes



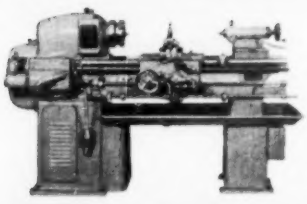
12" — 14" — 16" 18-speed Geared Head Lathes



12" — 14" — 16" 12-speed Geared Head Lathes



No. 2 General Purpose Lathe



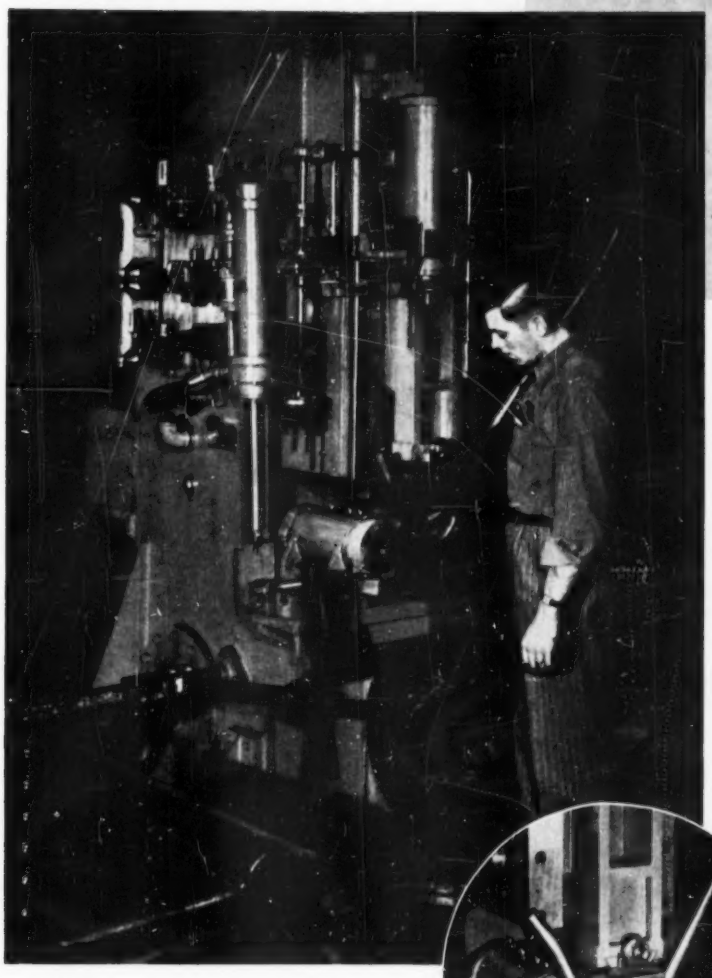
No. 1 General Purpose Lathe

9" x 24" Tool & Gage-Makers' Lathe

New PINES 20-TON BENDING PRESS

PRODUCES AUTOMOTIVE EXHAUST PIPES

50% FASTER



▲ Production view of new Hydraulic Bending Press now producing, in a single setup and with one operator, 4 to 8 multiple bends on automotive exhaust and tailpipes at speeds from 600 to 800 bends per hour.

The new Pines 20-Ton Hydraulic Pipe and Tube Bending Press is now establishing new records of production efficiency on many different bending operations. For example, on automotive exhaust and tailpipes, multiple bends with 4″ and 6″ radii are now produced in 1-1/4″ to 2″ O.D. 16 ga.-18 ga. tubing at speeds ranging from 600 to over 800 bends per hour.

On an over-all basis, current results show these jobs are produced 50% faster than with ordinary bending press equipment. At the same time, because of the design of the Pines, savings up to 30% in setup time are effected. Further, because more jobs can be handled in a single setup, there's a substantial reduction in tooling expense. If you have work adaptable to a bending press, it will pay you to see Pines today.

◀ Closeup view of Pines Bending Press forming 4th bend in a 1⅝″ (16 ga.) CRS automotive exhaust pipe. Note how wing dies are controlled by side-mounted cushions through heavy crank arms. Interchangeable pick-off turret of angle-of-bend selector saves set-up time on repeat jobs.

CHECK THESE COST-CUTTING PRODUCTION FEATURES

- **Twin Equalizing Side-Mounted Cushions** — provide greater working clearance, maintain constant torque, reduce flattening and distortion.
- **Faster Cycling** — angle-of-bend selector indexes and resets to starting position automatically without indexing through idle stations, increases output.
- **Greater Work Handling Capacity** — extra clearance reduces number of setups on multiple bending, permits broader use of uniform radii, cuts tooling and production costs.
- **Interchangeable Pick-Off Turret** — for angle-of-bend control. Permits storing and remounting for repetitive jobs, reduces setup time.
- **Adjustable Ram Speed Control** — assures efficient operation, simplifies setups. Ram can be lowered slowly or stopped at any point.

WRITE FOR NEW 4-PAGE BULLETIN

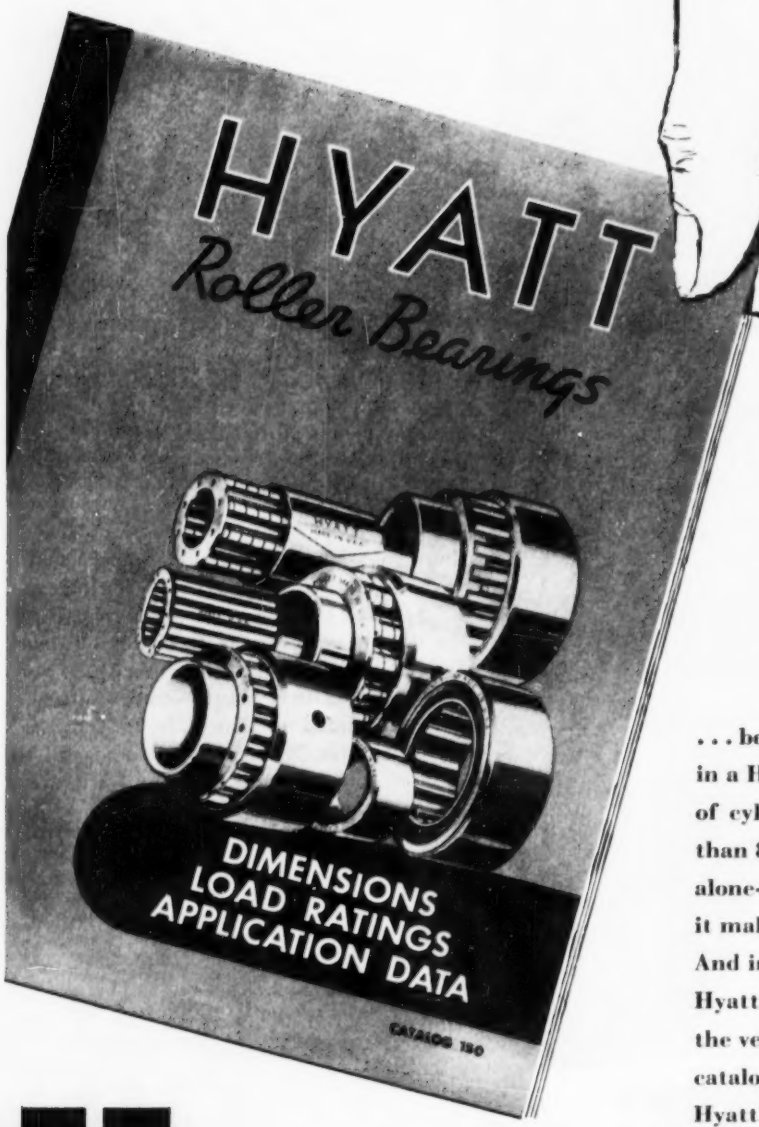
Write today for free bulletin completely illustrating and describing the new Pines Bending Press and its cost-cutting production features.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery | 671 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

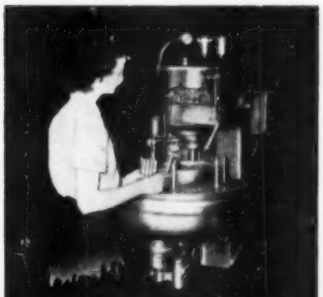
The answer to any bearing problem...



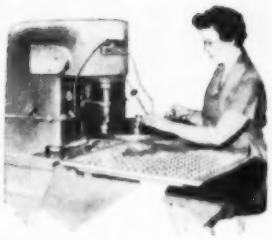
is right at your fingertips!

. . . because you'll find all the right answers in a Hyatt catalog. Hyatt's complete line of cylindrical roller bearings—more than 800 sizes in the Hy-Load series alone—makes your job easier, because it makes possible greater design flexibility. And in addition, when you specify Hyatt bearings you know you're getting the very best! If your file of Hyatt catalogs is incomplete, contact one of Hyatt's sales-engineers—or write to Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS



Assembly speed is doubled using Multipress to crimp a small brass contact to pen-type flashlight cases.



Scrap losses drop sharply as Multipress doubles staking speed on high precision voting-machine counter wheel assembly.

Output is boosted 100% by famous toy train maker, staking a 6-part assembly together with Multipress.

MULTIPRESS® DOUBLES PRODUCTION SPEED

On Six More Typical Operations

Faster production, better quality, less scrap, safer operation, easier handling, quieter action, and other profit-boosting results are run-of-mine with Multipress.

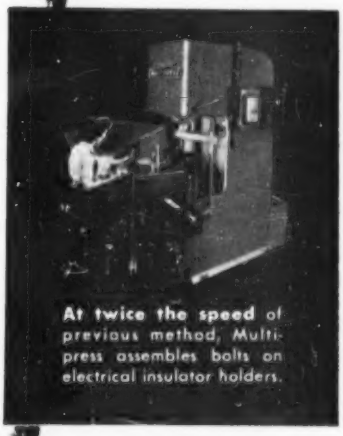
In the six cases shown here, Multipress *doubled* production rates. Hundreds of other reports tell of gains ranging up to 8 and 10 times the speed of previous equipment.

How does Multipress do it *so consistently?*

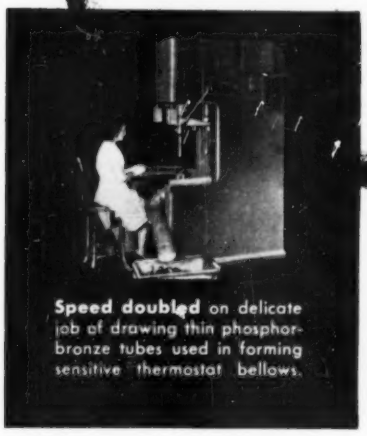
It is uniquely engineered to provide the smooth, controlled action of oil-hydraulic power *at its versatile best!* Infinitely adjustable ram pressures and stroke length make it easy to eliminate all unnecessary ram *travel* and ram *effort*. *Controlled* ram speed eliminates hammer-blow impact, cuts wear and tear on tooling, and permits better metal flow.

Multipress also offers standard attachments for extra efficiency on most production needs. It is easily equipped with automatic feeds, indexing tables, ejection devices, auxiliary ram actions . . . controls for automatic time-delay, hold-down, vibratory pressure application, sequence operations, etc. Multipress offers nine frame sizes . . . one-ton to 75-ton capacities. Write for details!

In only four stages, Multipress deep-draws a precision ordnance part formerly requiring 8 draws.



At twice the speed of previous method, Multipress assembles bolts on electrical insulator holders.



Speed doubled on delicate job of drawing thin phosphor-bronze tubes used in forming sensitive thermostat bellows.

DENISON HydrOILics

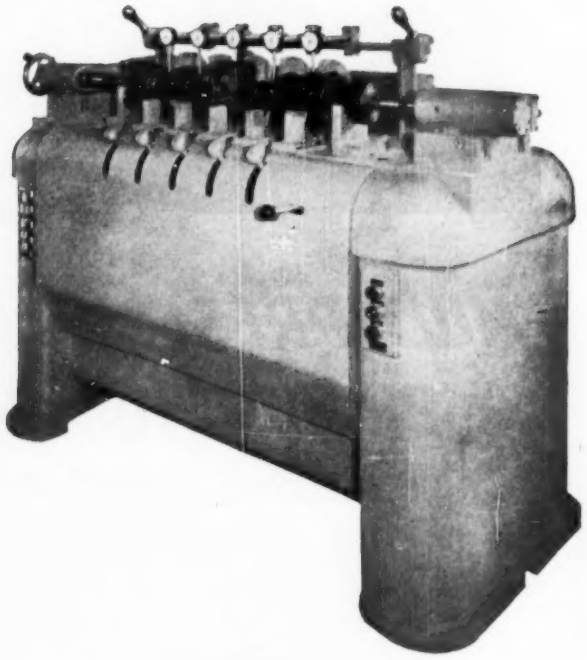
The DENISON Engineering Co.

1164 Dublin Road, Columbus 16, Ohio

Impco Straighteners

Tailor-Made and Precision-Built For

- CRANKSHAFTS
- AXLE SHAFTS
- CAM SHAFTS
- ROCKER ARM SHAFTS
- TRANSMISSION SHAFTS
- OTHER PARTS OF THIS TYPE

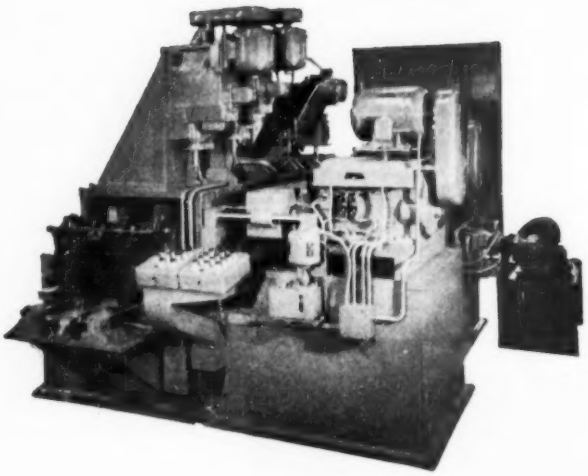


IMPCO Shaft Straighteners incorporate a new principle which straightens shafts by pulling downward instead of pressing the point of runout. A battery of dial indicators makes it possible to locate IMMEDIATELY the amount of greatest runout. These indicators, which can be mounted on a common swivel bracket or on anvils with ample over-travel, are so located that they will not be harmed by loading or straightening of the part.

ALL IMPCO Straighteners are driven by means of a hydraulic double vane rotary cylinder. A convenient filler and large cleanout for the hydraulic oil tank are located on the back side of the machine. Moving parts are encased below the working surface for greater safety and compactness. Tailor-made to customer specifications, IMPCO Straighteners are designed to meet special production needs with consistent accuracy, speed, and efficiency.

CUSTOM-BUILT MACHINES to Fit Your Needs

This automatic transfer machine used for drilling, tapping, and trepanning, was built to specification for a leading automobile manufacturer. It handles 60 cylinder blocks per hour net. We offer it as one example of how IMPCO can solve a particular machine problem. Remember, IMPCO will design plans for you, work from your own prepared specifications, or modify existing machines to meet your specific needs.



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Roselawn Center Building
Cincinnati 37, Ohio

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Box 373
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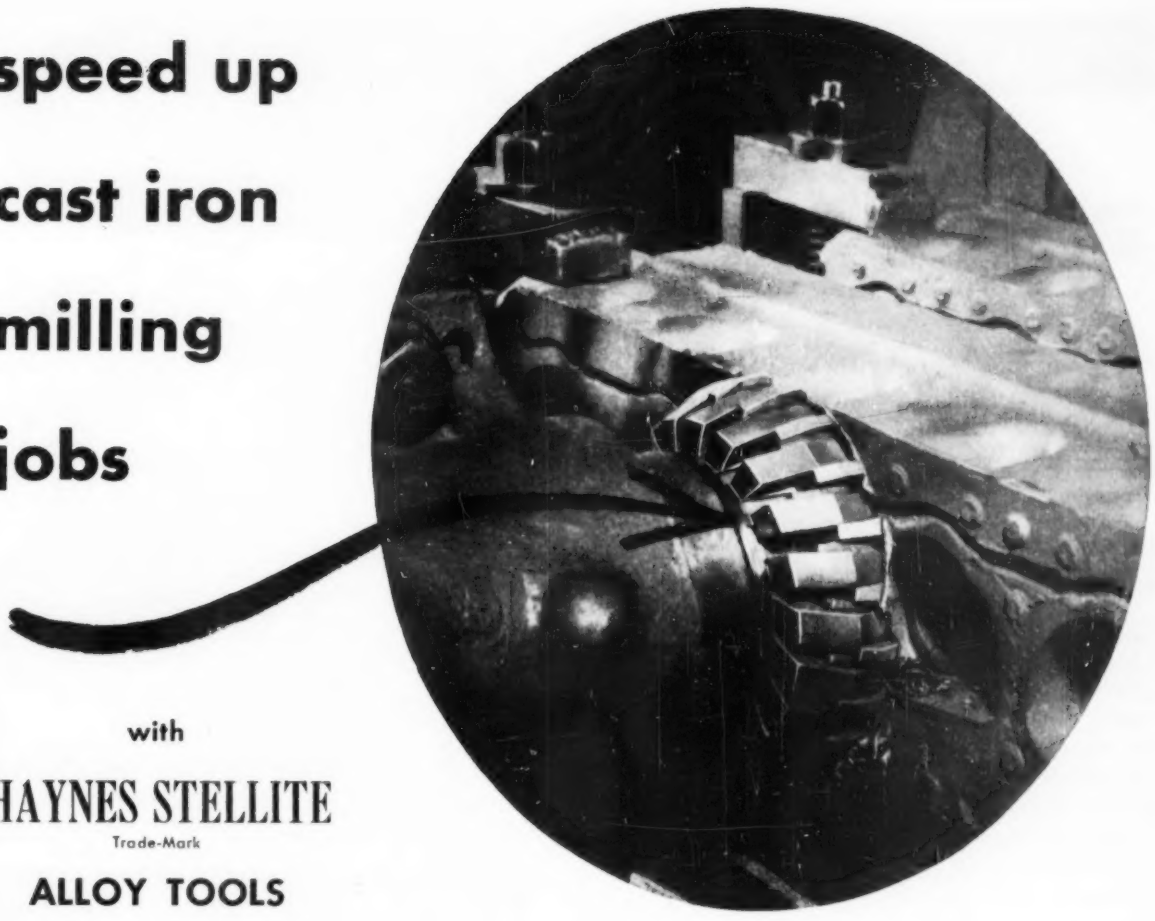
IMPCO **INDUSTRIAL METAL PRODUCTS CORP.**
P. O. Box 156 Lansing 1, Mich.

speed up cast iron milling jobs



with

HAYNES STELLITE
Trade-Mark

ALLOY TOOLS

High compressive strength at cutting temperatures . . . good impact strength . . . and extremely low frictional coefficients make HAYNES STELLITE alloys ideal tool materials for cast iron milling jobs.

Two hard grades of HAYNES STELLITE alloy are available for milling cast iron at high speeds. On soft cast iron (less than 185 Brinell), these tools can take light milling cuts at speeds up to 300 surface ft. per min. For heavy milling, speeds up to 250 surface ft. per min. can be used.

Hard cast iron up to 240 Brinell can be milled at speeds as high as 200 surface ft. per minute. Safe chip loads range up to 0.025 in. per tooth.

Tougher grades of HAYNES STELLITE alloy are available for efficient milling of castings that have irregular contours, surface imperfections, or inclusions, or where there are variations in chill depth.

HAYNES STELLITE alloy tools are available as fabricated shell-end mills and as insert milling-cutter blades. The different grades of alloy can be used for a wide variety of milling conditions. If you wish help on your own particular milling problems, write to the nearest Haynes Stellite Company office.

For a copy of the new manual, "HAYNES STELLITE Metal-Cutting Tools," write to our General Offices.

HAYNES
TRADE-MARK
alloys

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
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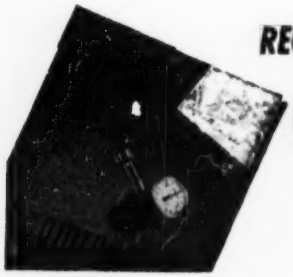
"Packaged Precision"

Measures high-precision holes to fractions of .0001", with these advantages

Here in a compact self-contained unit, you have the high precision that has found so prominent a place in the jet engine program. By unique design, Comtorplug gives true 2-point gaging, self-aligned and centered. Thus it enables you to check any part of a hole—including very bottom—detecting out-of-round, front or back taper, bell mouth, etc.

- There are no gimmicks to get out of order, such as wiring, hose or electronic gear. And because self-contained Comtorplug has none of these, and no heavy base, it is instantly usable anywhere: machine, bench, or lab.
- Shows actual measurement to fraction of .0001", and is "just right" for Statistical Quality Control programs.
- No skill needed to use it accurately—built-in features and 10 minutes' instruction do the trick.
- Marvelous thing about Comtorplug from production man's viewpoint is that you can put it to work in your shop without any planning, wiring, air lines or rigmarole—just a simple briefing on its use.
- Comtorplug is a rugged, shockproof instrument. Use it for size control at the machine as well as bench inspection, wherever you produce precision holes in volume.



REQUEST BULLETIN 46

COMTOR CO.

68 FARWELL STREET
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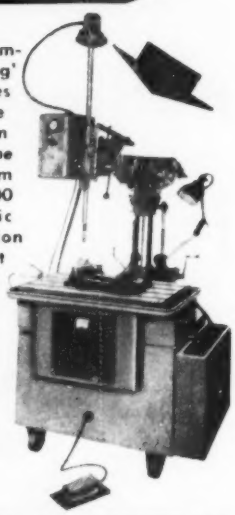
DRILL HOLES AS SMALL AS .030" IN ANY METAL OF ANY HARDNESS OR THICKNESS!

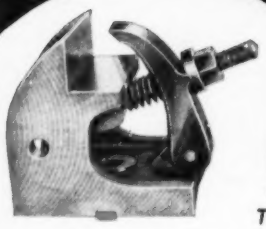
The M-300 Elox Electron Drill* combines the best in the 'arc machining' process. In addition to drilling holes as small as .030" it is adjustable for machine finishes ranging from *coarse, fine, extra fine and super fine* ...on any metals from magnesium to cemented carbide. The M-300 with exclusive Elox Automatic Feed allows for continuous operation with much of the human element removed. Using electrodes costing less than 3¢ per inch, with 'super fine' cutting, 1" of electrode will cut as much as 33" of hardened steel! Here indeed, is a dual-purpose machine that is being used for production machining of hardened steels and for removing broken drills in salvage. Write today for details and list of users.



ELOX CORPORATION OF MICHIGAN

728 N. ROCHESTER RD. • CLAWSON, MICHIGAN

CUT SET-UP COSTS HUNDREDS OF WAYS WITH HART MILLING FIXTURES



"Masters of A Thousand Set-ups"

Eliminate the need for many special expensive jigs and fixtures.

You will save time and money on most set-ups with Hart Milling Fixtures. They hold round, hexagonal, octagonal or square stock, for miller, shaper, drill press and tapper; they reduce set-up time and speed production. Hart Milling Fixtures are made in four useful sizes, and designed to be used in horizontal or vertical position. Let us send you full description and prices.

Write for illustrated folder

WALTER W. FIELD & SON, INC.

39 Hayward St., Cambridge 42, Mass.

Mattison Grinder beats old time (15 hours) by 12 hours

The picture above shows a punch and die grinding operation on a Mattison High-Powered Precision Surface Grinder at Lyon Metal Products, Incorporated. Previous time on a converted planer-grinder was 15 hours — now with a Mattison Grinder equipped with special fixture, grinding time has been reduced to 3 hours.

Mattison Grinders are proving profitable investments in plants where "time out" for reconditioning is a vital factor in meeting production schedules. Surfaces are reconditioned and edges sharpened in a minimum of time, eliminating costly delays and holdup of production. Many manufacturers installing the Mattison Grinder for reconditioning dies find many other uses for it in grinding flat surfaces where accuracy and fine finish are required. For complete information on the Mattison High-Powered Precision Surface Grinder, send for free copy of our latest circular.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

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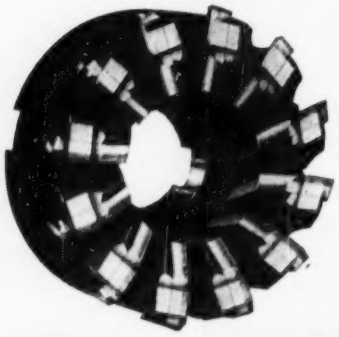
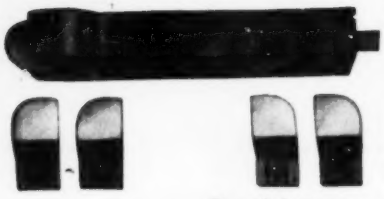
INSERTED-BLADE MILLING CUTTERS AND SINGLE-POINT TOOLS FOR LOCOMOTIVE AND CAR MAINTENANCE

A PRODUCTION CUTTER *for* HEAVY DUTY JOBS



APEX offers cutters for many jobs. Here's one that takes a big chip fast. It can be had with H.S.S., Stellite, Cobalt or Carbide tipped blades. These blades adjust automatically in two directions. No damage to carbide tips. Diameters from 8" to 24". We also make cutters for lighter work. Write for catalog.

Adjusted Serrated Style for Axle Jobs



A

Special types made promptly to order

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(A) END MILL. (B) COMBINATION BORING AND FACING MILL. Both are made with tapered, serrated blades adjustable to hold diameters. (C) ALTERNATE ANGLE CUTTER. Slots all widths ½" and over, and all diameters 4" and larger. Blades of H. S. Steel, Super Cobalt, Stellite or Carbide Tipped.

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Available for INDUSTRY RAILROADS SHIPYARDS

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SEND FOR THIS FOLDER And DATA SHEETS

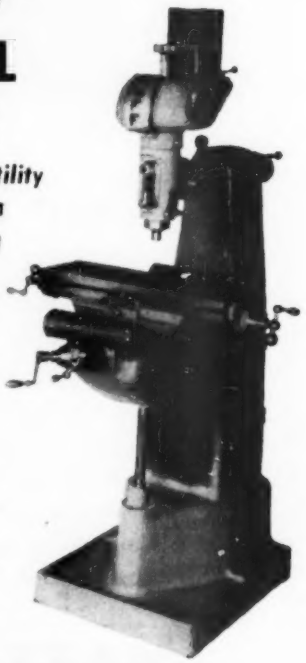
IT'S THE LONG STROKE UNIT!

12" stroke on base only 16⅜" long. Or smaller model, 9" on 13⅜" base. LONG STROKE makes it easy to change tools. TRAVERSE RATE over 400" min., FEED RATE up to 30" min. CAPACITY ½" in steel.

Self-contained, completely hydraulic. Unusually accurate and dependable. Especially adapted to use on transfer machines. For catalog-folder and data sheets, write **DRILLUNIT, INC., 635 Mt. Elliott, Detroit 7, Mich.**

DUFF VERTICAL MILLER

Universal Head Versatility
Compact in Design
Ease of Operating



RANGE:

Table size	8" x 24"
Longitudinal Feed	15"
Vertical Feed of Knee	14"
Cross Feed	8"
Maximum Distance Spindle to table	15"
Quill Travel	3"
Collet Capacity	½"
Speed Range	300 R.P.M. to 3200 R.P.M.
Motor	¾ H.P.
Weight of Milling Machine approx.	1200 lbs.

Write for complete information.

DUFF MACHINE CO.

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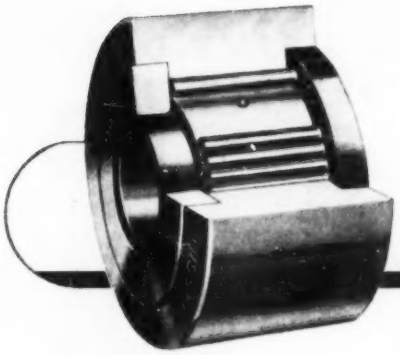


How to increase the versatility of cam follower applications

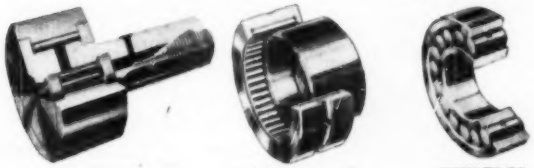
The ever increasing number of cam action applications in modern machinery is partially responsible for insuring greater efficiency and productivity through increased automatic operation. Helping to make this possible is the availability of a precision means of converting motion originating through cam action to adjacent mechanisms with an adequate anti-friction cam follower bearing.

The first such bearing acceptable to machine builders was produced by McGill and is now used extensively in all types of automatic machinery. The MULTIROL Cam Follower design requires mounting by means of securing the stud, leaving the anti-friction roller free to follow the cam.

Another more recent McGill development in cam follower design is the MULTIROL CYR series bearing that uses an inner race rather than the conventional stud. The bearing is sealed with roller retaining end plates tightly fitted and secured to the shoulders of the inner ring. Yoke mounting is possible where desirable with the CYR bearing on shaft sizes ranging from ¼" to 1¼" for corresponding roller diameters of ¾" to 4".

The CYR series bearing is non-separable with a thick outer race section to withstand the heavy shock load encountered on all types of cam applications found on automatic machinery. This heavy duty bearing is not only suitable to direct cam action over a wide speed range but it can be applied as a means to control motion of machine parts that require guide or support rollers. Examples include lathe or planer beds, welding machine heads, aircraft wing flaps, wire straightening rollers, etc.

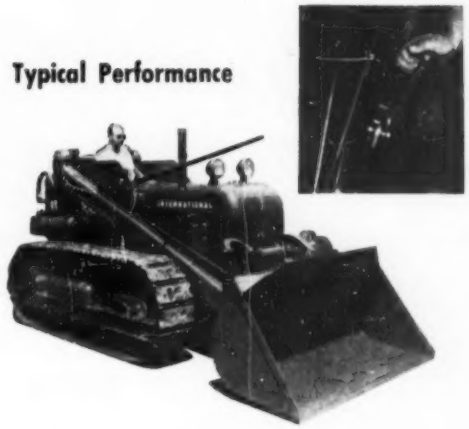
Other McGILL® Bearings



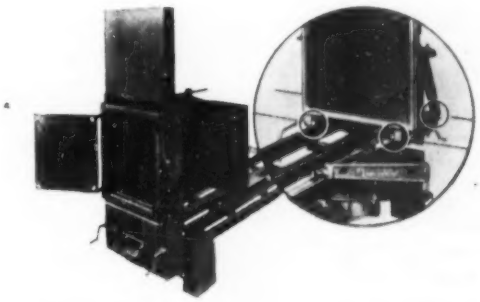
MULTIROL CF | MULTIROL SE | GUIDEROL

A new 140 page Bearing Reference Guide complete with 30 pages of vital engineering data has just been released by the McGill Manufacturing Company. It has the full story on the advantages of MULTIROL CYR Bearings as well as information on MULTIROL CF and SE and GUIDEROL Bearings. Send now for your copy of McGill Catalog No. 52.

Typical Performance



Bucyrus-Erie Company, South Milwaukee, Wisconsin uses MULTIROL CYR series bearings as quadrant rollers on the operating lever that controls the bucket on their TD-9 one yard Dozer-Shovel. These bearings allow easy and free lever motion as they ride the quadrant cam in one of four positioning pockets. McGill GUIDEROL bearings are used in the PVT hydraulic unit on this same Dozer-Shovel.



Typical of the varied uses MULTIROL CYR bearings can satisfy are the track rollers on the highly precision Process Copy Cameras built by Consolidated Hammer Dry Plate and Film Company of Chicago, Illinois. Here four CYR bearings support and guide the copy board along rails before the camera. These bearings permit free and accurate adjustments for sensitive camera focus.

McGILL® —Precision Bearings

McGILL MANUFACTURING COMPANY, INC.
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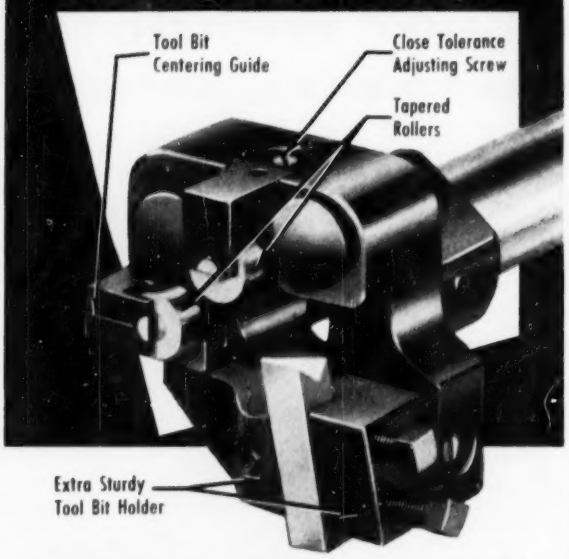
BOYAR-SCHULTZ SCREW MACHINE TOOLS

Standard Equipment in Progressive Shops



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For automatic or hand screw machines as well as turret lathes. A box tool with the stamina to deliver piece after piece to close tolerance over long production runs. An outstanding feature is the speed with which set-up is accomplished. A predetermined center line on the roller block provides for rapid return of re-sharpened bits to precisely the same cutting position with a minimum of down-time.

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Correct design and built-in sturdiness evident in Boyar-Schultz Tools, are the reasons for their close tolerance accuracy that contribute so much to profitable screw machine operation. Carried in stock for immediate delivery.

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- Model D for Reaming
- Model AR Tap Holder (Releasing)
- Model AP for Pointing
- Model H Box Tool Adapter
- Model RS Revolving Stop
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- Chucking Levers
- Cam Rollers and Pins
- Model G Grinding Fixture

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BOYAR-SCHULTZ Corporation

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Crank *raises* or *lowers* table; headstock moves 6" up or down by hand on scraped ways. Easy-to-reach controls cut handling time, too. 9" quill-supported spindle stroke, driven by 3½ h.p. V-belt motor. Motor speed 900 rpm. Drilling capacity of 1" in steel; 1¼" in cast iron. 8 spindle speeds from 150 to 1640 rpm. Drilling feed by hand or power.

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KURT ORBAN COMPANY, INC.

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IS NOW MADE OF STAINLESS STEEL THROUGHOUT

AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
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- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back

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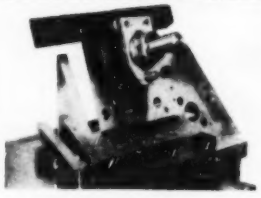

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- Tilts 90°
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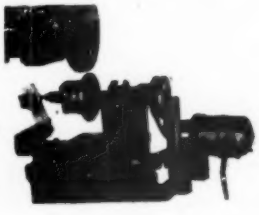

Ask us about your specific problems. Write for Booklet.

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"We can run Free-Machining ENDURO Stainless Steel Bars at about 90% of our Bessemer screw stock rate"

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Close tolerance, accuracy of section, uniform soundness, fine surface finish—to help you produce fine quality parts at highest production rates and at lowest costs. Plus the high strength of an alloy steel. Plus the stubborn resistance to rust and corrosion for which ENDURO is famous.

Free-machining ENDURO also is available in hot-rolled bars and wire. And experienced Republic metallurgists will offer you expert assistance in applying ENDURO Stainless Steel in any form. Just write:

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SIGOURNEY

M-100

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ACCURATE because table and column exactly squared one to the other.
LONG LIFE because of hardened and ground spindles.
SAFE because motor, driving belt and spindles are entirely enclosed.
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SMOOTH AT HIGH SPEEDS — sealed ball bearings throughout for smooth operation from 4000 R. P. M. to 10,000 R. P. M.
MODELS — with 1, 2, 3 and 4 spindles.

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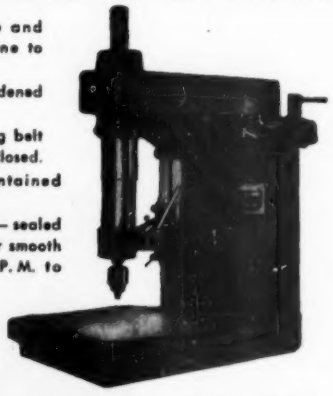

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Hartford 6, Conn.

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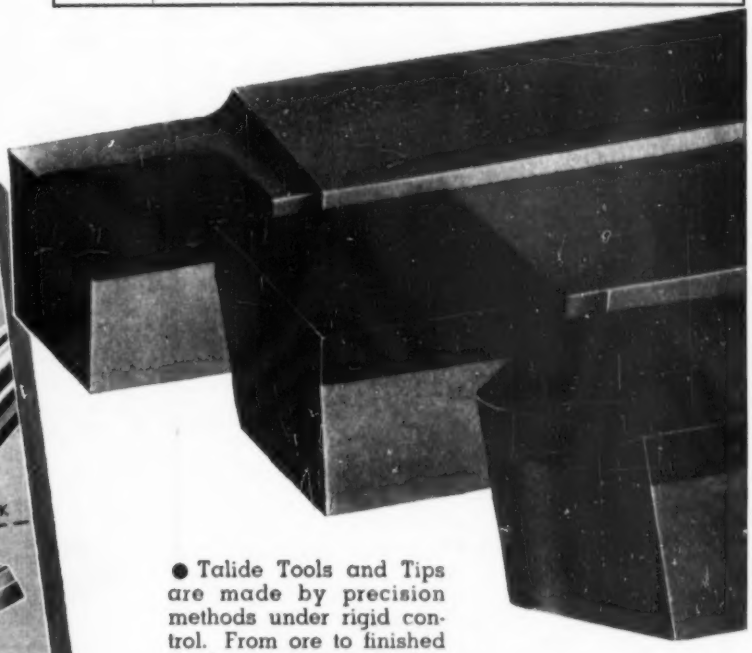

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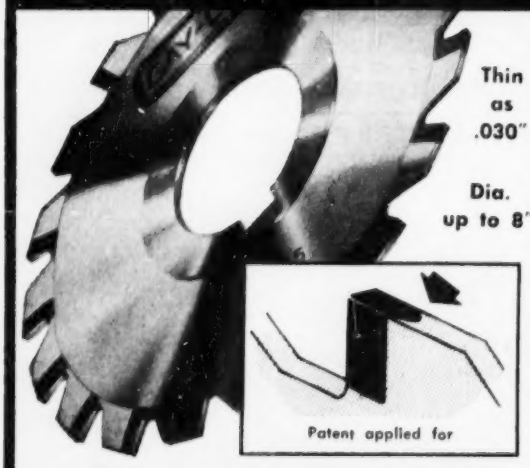

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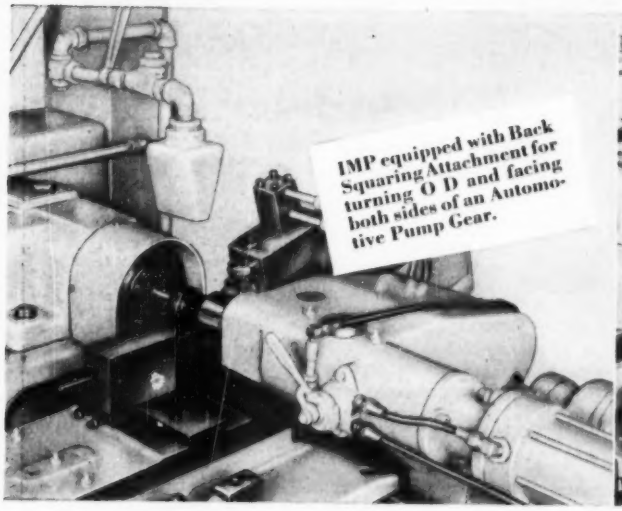
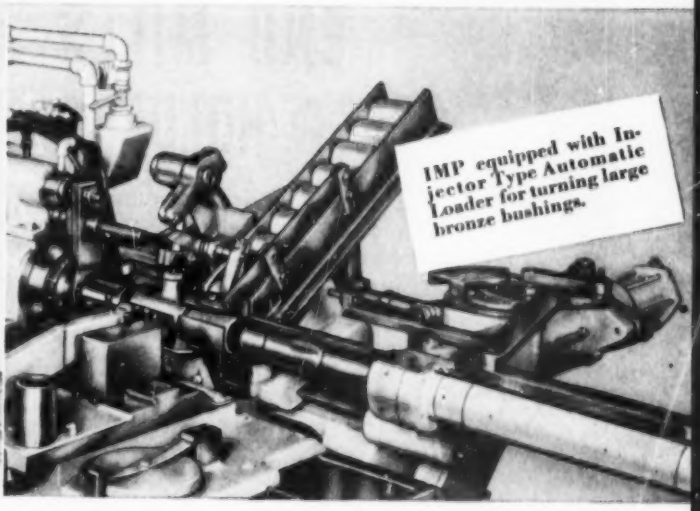
PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

A VERSATILE AUTOMATIC LATHE FOR SMALL WORK DEMANDING HIGH SPEEDS & EXTREME ACCURACY

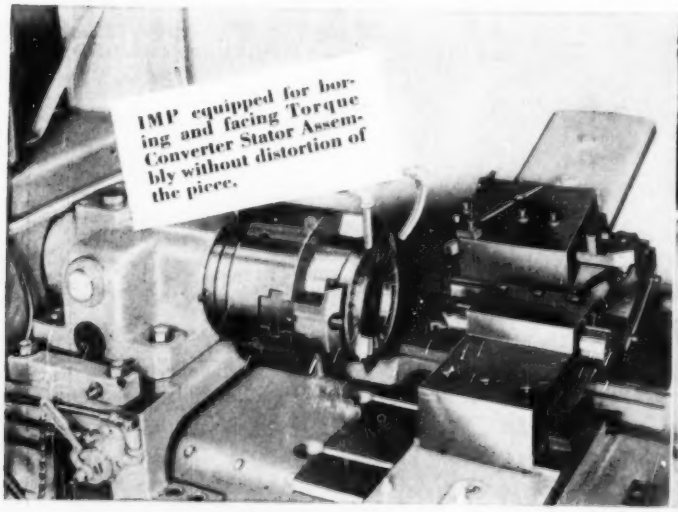


IMP equipped with Back Squaring Attachment for turning O D and facing both sides of an Automotive Pump Gear.

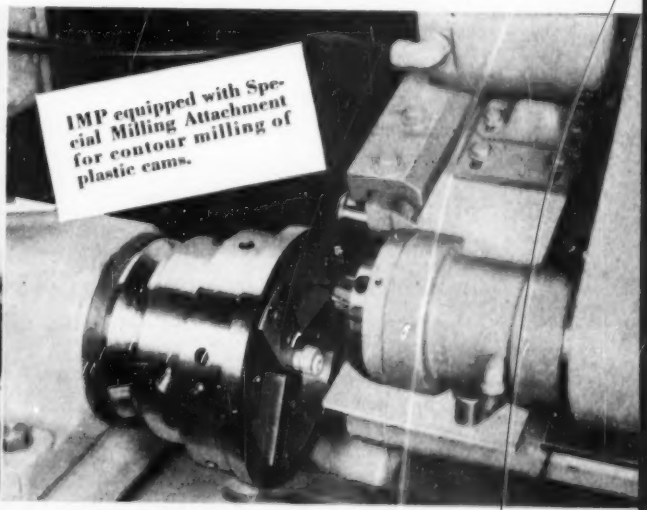


IMP equipped with Injector Type Automatic Loader for turning large bronze bushings.

THE Lo-swing IMP AUTOMATIC LATHE lends itself to practically unlimited tooling possibilities. The close-up views above and below show typical applications of standard and special attachments to the base machine which have resulted in increased production and lower costs. • If you have a production turning job requiring high speeds, fine finishes and extreme accuracy, write for Lo-swing IMP Bulletin No. N-50. Seneca Falls engineers will be glad to assist you with any of your turning problems. Your inquiries are invited.



IMP equipped for boring and facing Torque Converter Stator Assembly without distortion of the piece.



IMP equipped with Special Milling Attachment for contour milling of plastic cams.

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PRODUCTION COSTS ARE LOWER WITH Lo-swing

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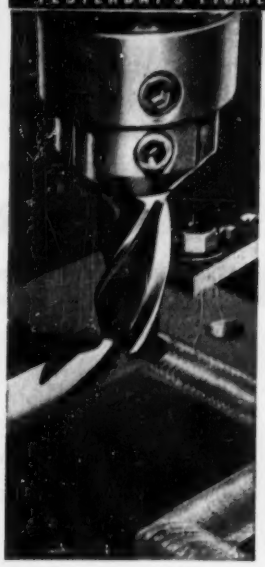

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(Both are Stock Items)

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WRITE FOR BULLETIN 500

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Increase output 11% on one machine...completely eliminate lubrication downtime

Lubrication trouble on a key machine created a real problem for a leading manufacturer in America's canning industry. Lubricant was being wasted by the gallon. Shutdowns were frequent. Delays on this single machine slowed production throughout the plant.

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An Alemite lubrication engineer can show *you* how to cut costs, decrease down-time, increase profits. For further information, contact your Alemite distributor—today!

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Wherever metal touches metal, wherever you find machinery in motion, you're most likely to find Alemite Lubrication and Lubrication Systems on the job. Here are but a few of the industrial leaders who use Alemite.

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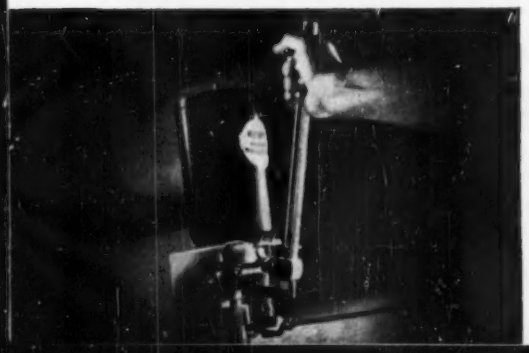

Alemite Accumeter systems give you automatic lubrication... uninterrupted production

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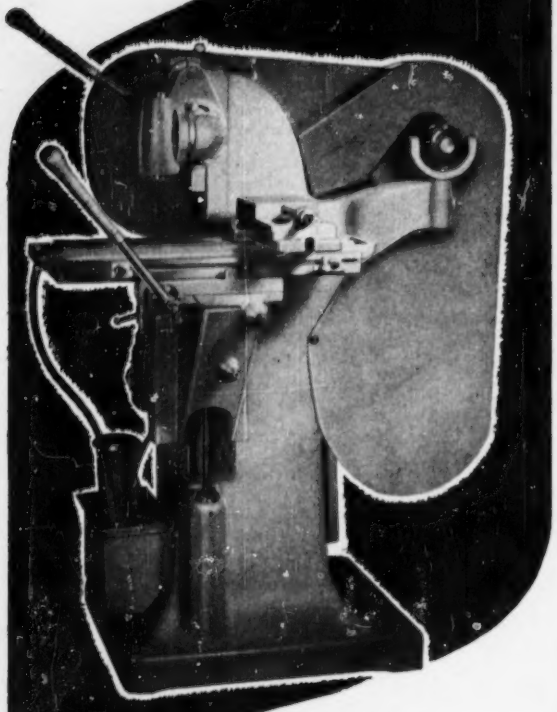

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Suggestions as to how a U. S. No. 1 Milling Machine can cut costs on your particular production needs, as well as complete data on the basic machine and attachments, gladly furnished on request.

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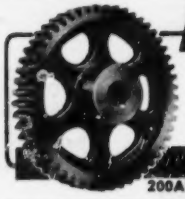

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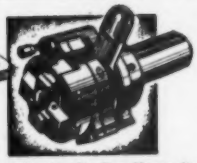

famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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13 Key Moore Tools help put the PRECISION in Harig Dies

KARL HARIG

"When owner-management invests its money in machinery," says Karl Harig, founder and president of Harig Manufacturing Corporation, "it does so only after a thorough analysis and careful selection of available equipment." So it's significant that Harig, one of America's foremost producers of carbide, lamination, progressive, stamping and other types of precision dies, employs 13 Moore precision-built machine tools for many of its most critical toolroom operations.

A trip through Harig's modern Chicago plant reveals:

3 MOORE JIG BORERS, for accurate locating and boring of holes in a fraction of the time required by other means;

6 MOORE JIG GRINDERS, for relocating and grinding of holes and contours—within tenths—after hardening;

3 MOORE PANTO-CRUSH WHEEL DRESSERS, for speedy, cost-cutting performance of both crush-forming and diamond-dressing on the wheel spindle of a surface grinder;

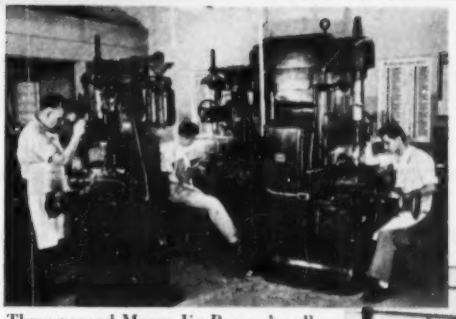
1 MOORE DIE FLIPPER, for "mechanized" die tryouts and assembly.

The combination of Harig craftsmanship and Moore precision tools has been an important factor in Harig's successful effort to meet continuing demands for faster production of intricate dies, tools, jigs, fixtures and gauges.

Why not discover how Moore tools can bring more speed and greater accuracy to *your* toolroom. Write today for our detailed literature.

Moore Special Tool Company, Inc.
738 Union Avenue, Bridgeport 7, Connecticut

A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.



Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.

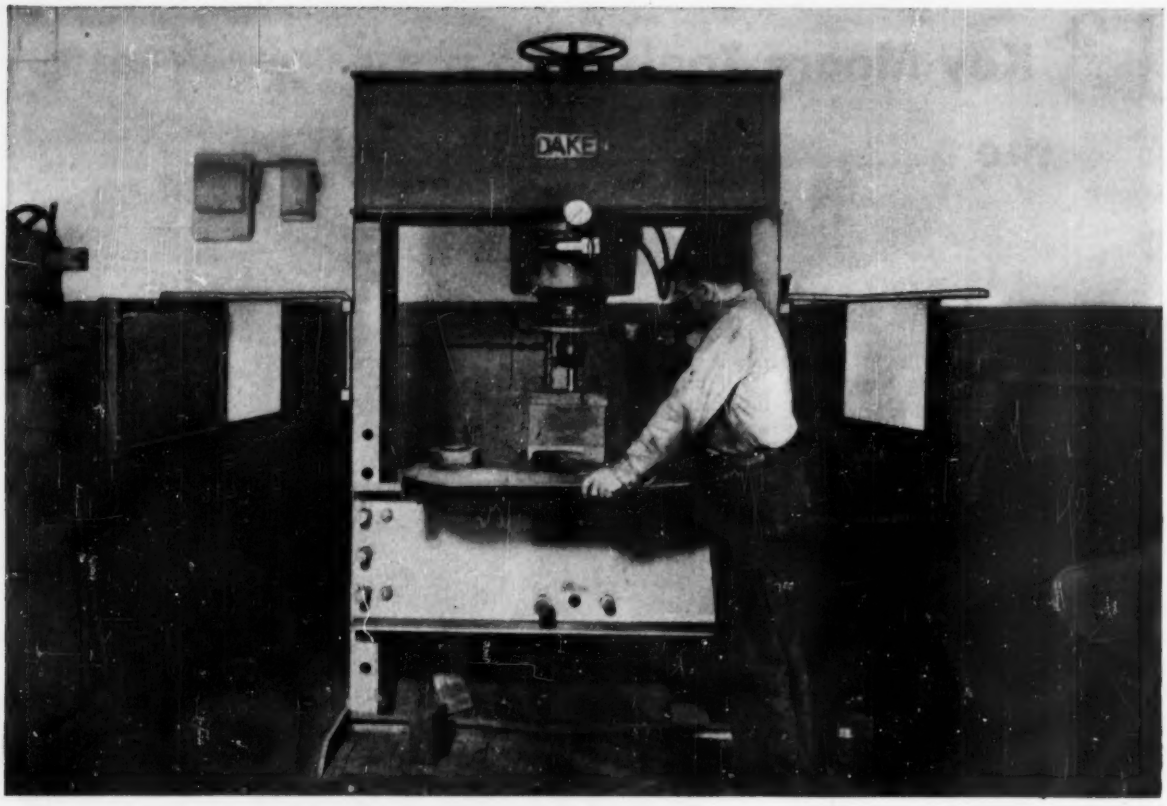
Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.

A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy



DAKE PRESS REPLACES THE "HERNIA METHOD" OF KNOCKING OUT DIE INSERTS

The job of knocking out forging die inserts formerly required two men, and sometimes several hours of hand sledging. Now one man does it easily in a few minutes with a Dake 125-ton Air-hydraulic Press.

The die and drive pin are placed under the press ram as shown, and pressure is applied up to the 125-ton capacity. If pressure alone fails to break the insert loose, heat is applied around the die until expansion permits breakaway, which comes with a sudden impact under the sustained high pressure.

Special safety gates — hinged to the side frame of the press — are kept closed during application of pressure and heat as a protection to the operator.

Savings in labor costs have been tremendous, but management reports that even this great benefit has been overshadowed by the improvement in labor relations, and the more intelligent grade of manpower that can be assigned to the work.

Dake Hydraulic Presses have scores of uses in industry. A variety of styles and capacities makes them adaptable to almost any requirement. We suggest that you contact your nearest Dake representative about your pressing problems — or write us and we will ask him to call.

Dake Engine Company, 636 Seventh St., Grand Haven, Mich.

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Arbor Presses

Hand-Operated Hydraulic

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Guided Piston

Gap Type Presses

Movable Frame

Two important parts of

UNIONMELT WELDING

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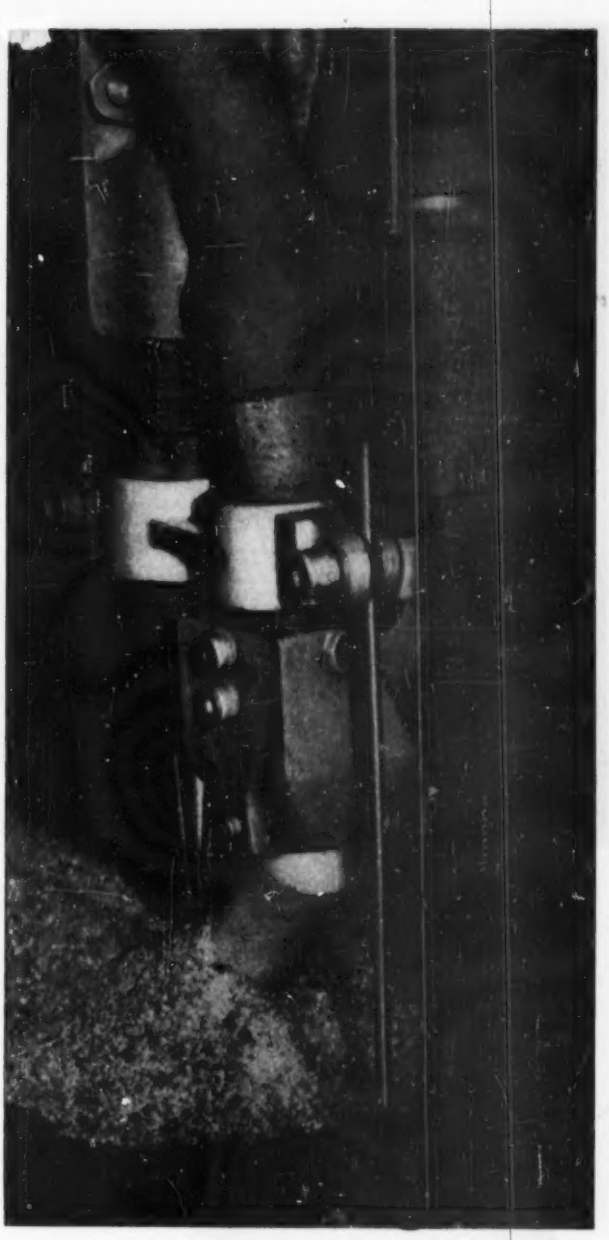
You Can't See



This is UNIONMELT welding—instantly recognized by the special granulated material you see blanketing the weld. *You can't see* the powerful electric arc that fuses the metal beneath at the highest production rate attainable. No sparks or glare disrupt nearby plant activity.

You can't see the LINDE SERVICE that stands behind every UNIONMELT installation to assure its efficient and profitable operation. Only LINDE can give you this unique combination of research, engineering, and over 40 years of welding know-how that is helping LINDE customers save money and improve production. And only LINDE can give you the accumulated benefits of more than 18 continuous years of development, field testing, and improvement in the field of submerged melt welding where it pioneered.

LINDE's Service Engineers will gladly help you design a UNIONMELT installation to meet your exact requirements. They will also be available to help you when a tough production problem comes up. Call your nearest LINDE representative today.

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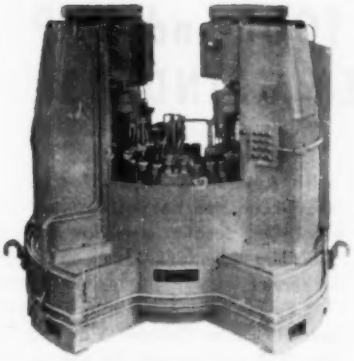
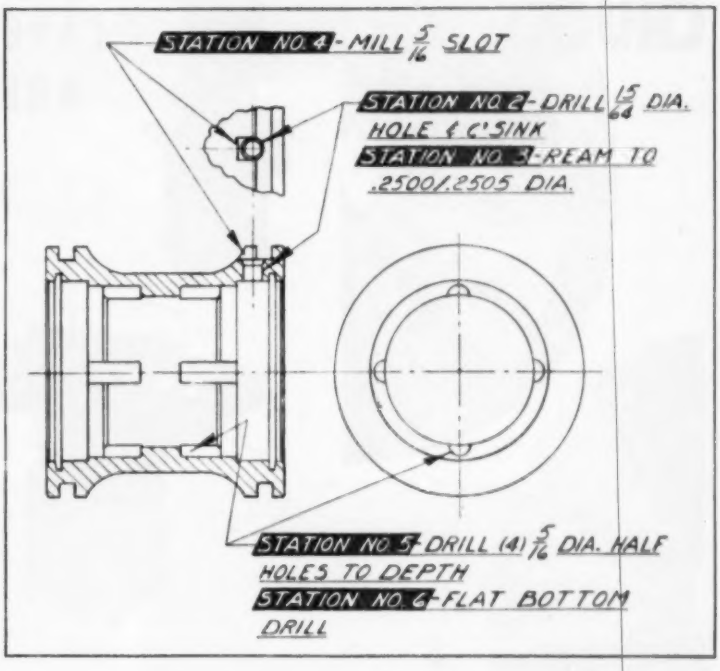
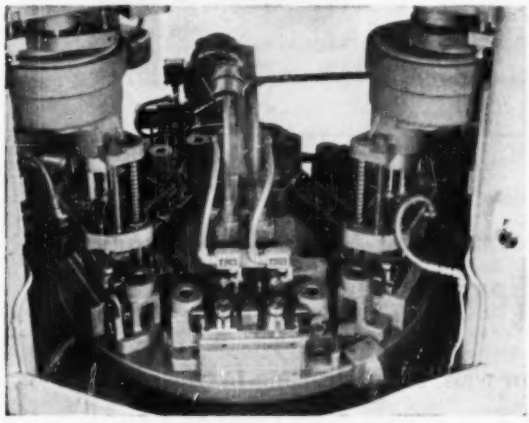
TURNER solves another *tough* production problem!

Special automatic indexing-type machine drills, reams, mills and countersinks 440 steering gear pistons per hour at 100% efficiency!



Turner's specially designed fixtures and multiple spindle heads account for the exceptional efficiency of this time-saving machine operation. An unusual feature of this particular fixture and clamping mechanism is the dead center indexing table mounting a stationary cam track. Rollers, attached to the fixture clamping mechanism, pass through as the table indexes. Limit switches, also attached to the center, make it impossible for the machine to operate unless the parts are clamped in place. In the close-up, at left, you will notice that the multiple spindle drill heads have guide pins which enter bushings in the fixture before the actual machining operation takes place. This insures extreme machining accuracy.


STATION NO. 4 - MILL 5/16 SLOT
STATION NO. 2 - DRILL 15/64 DIA. HOLE & C'SINK
STATION NO. 3 - REAM TO .2500/.2505 DIA.
STATION NO. 5 - DRILL (4) 5/16 DIA. HALF HOLES TO DEPTH
STATION NO. 6 - FLAT BOTTOM DRILL



Turner solves high production problems such as this by first studying the problem thoroughly, applying years of technical experience; then, by designing fixtures and spindle heads *exactly suited to your job*. With all Turner special purpose machines, standard bases and columns are used to keep manufacturing costs down. It means you are assured a machine specially designed for your application, yet without the high extra costs you might expect. Drop us a line; we'll be happy to look over your particular production problem.

The sequence of operations is as follows:

Station 1: Operator places part in the RH side of the fixture and the machine indexes to Station 2.

Station 2: (Four) 5/16" port holes are drilled to depth. At the same time, the next fixture has come into position at Station 1 and the loading operation is repeated. The first fixture moves to Station 3 and the (Four) 5/32" radius port holes are flat bottom drilled.

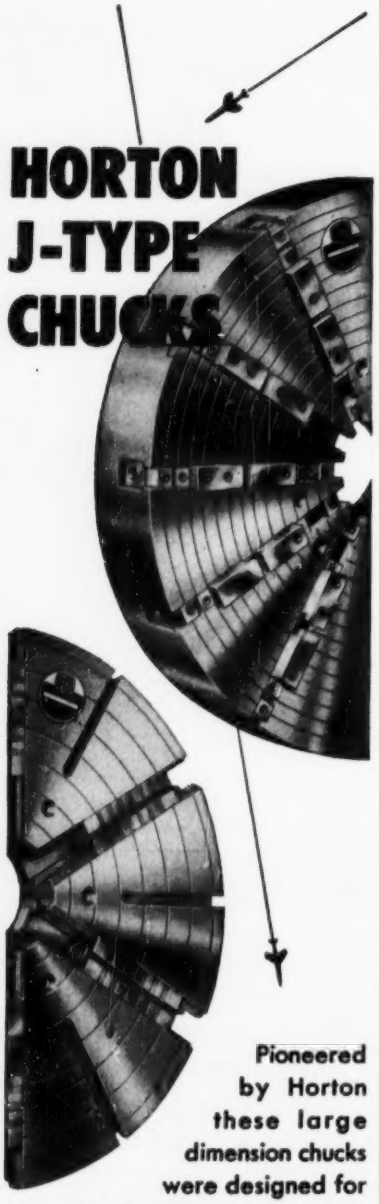
Station 4: The 5/16" slot is milled.

Station 5: The 15/64" hole is drilled and countersunk.

Station 6: The 15/64" hole is reamed to .2500/.2505".

The fixture is then indexed to starting Station 1 where the part is automatically unclamped, removed from the RH side of the fixture and placed end for end on the LH side of the fixture. At the same time, the new part is loaded onto the RH side of the fixture as in the first cycle of the machine. From this point on, the machine cycle is the same as previously described and for each complete cycle of the machine, the part will be completely machined as per the above operations.

HORTON J-TYPE CHUCKS



Pioneered by Horton these large dimension chucks were designed for the aircraft industry especially for machining various jet engine parts.

For 102 years Horton Chucks have kept pace with industry's demands.

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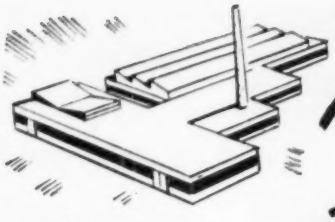

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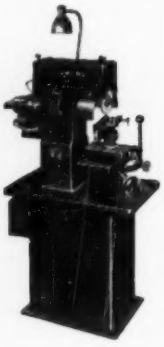

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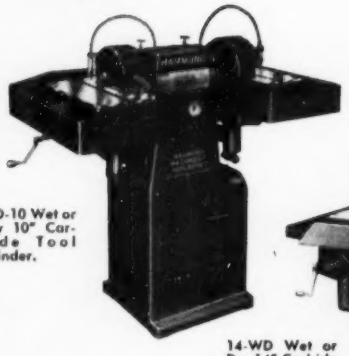
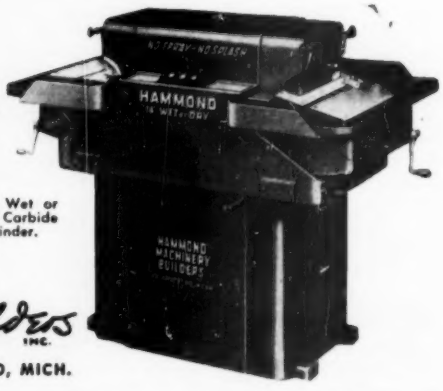


WD-10 Wet or Dry 10" Carbide Tool Grinder.



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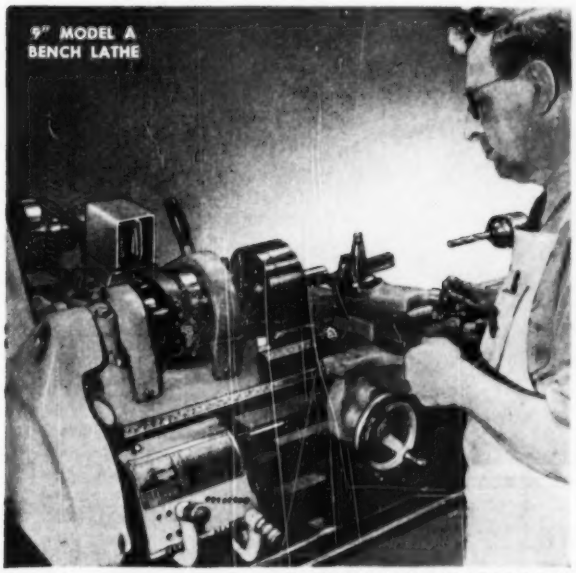

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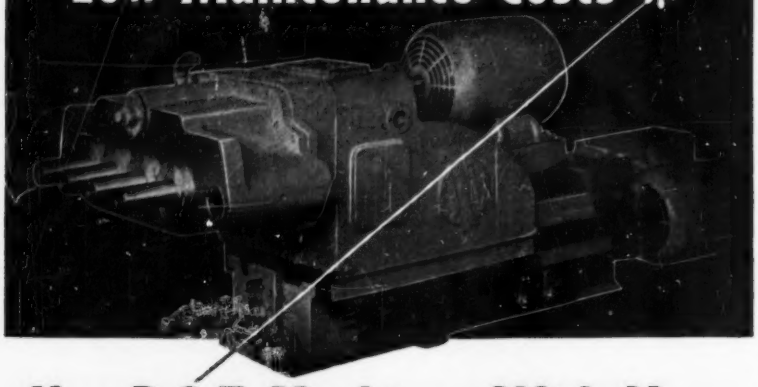

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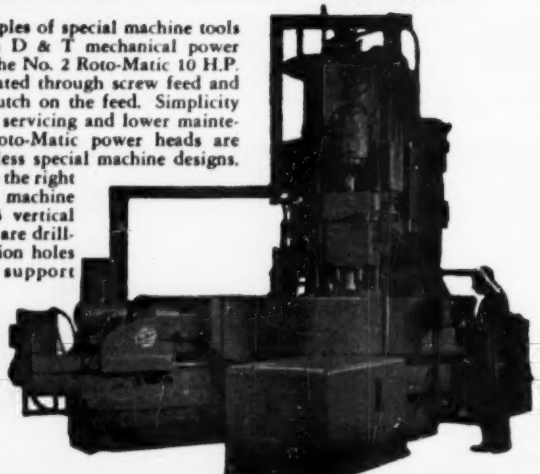
Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



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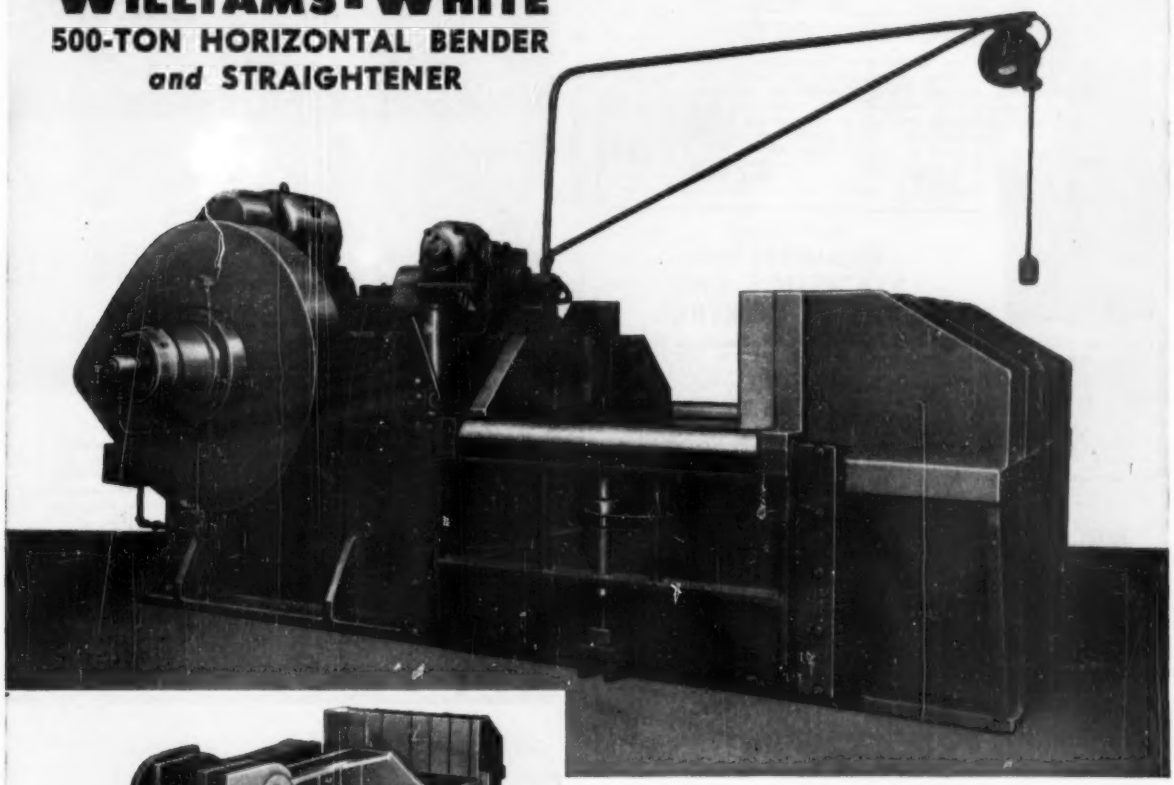

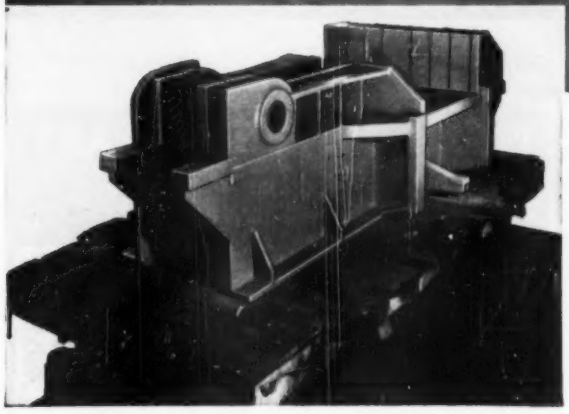

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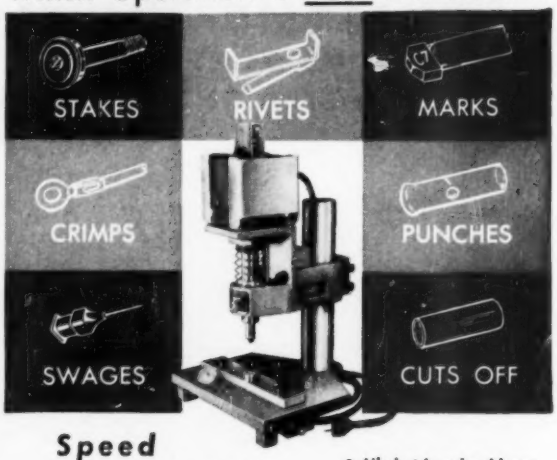

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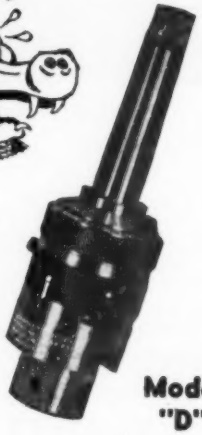

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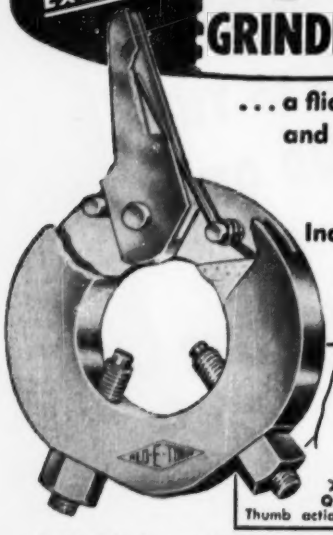

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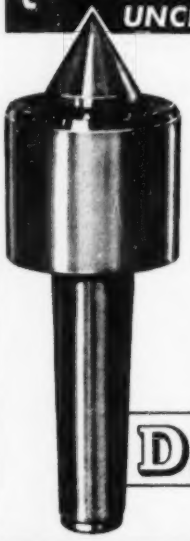

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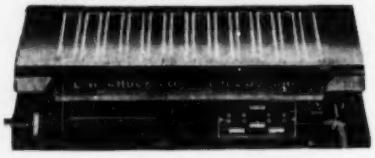

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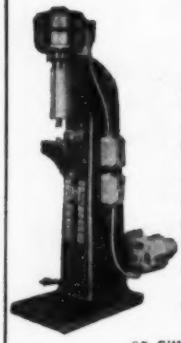

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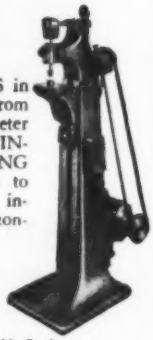

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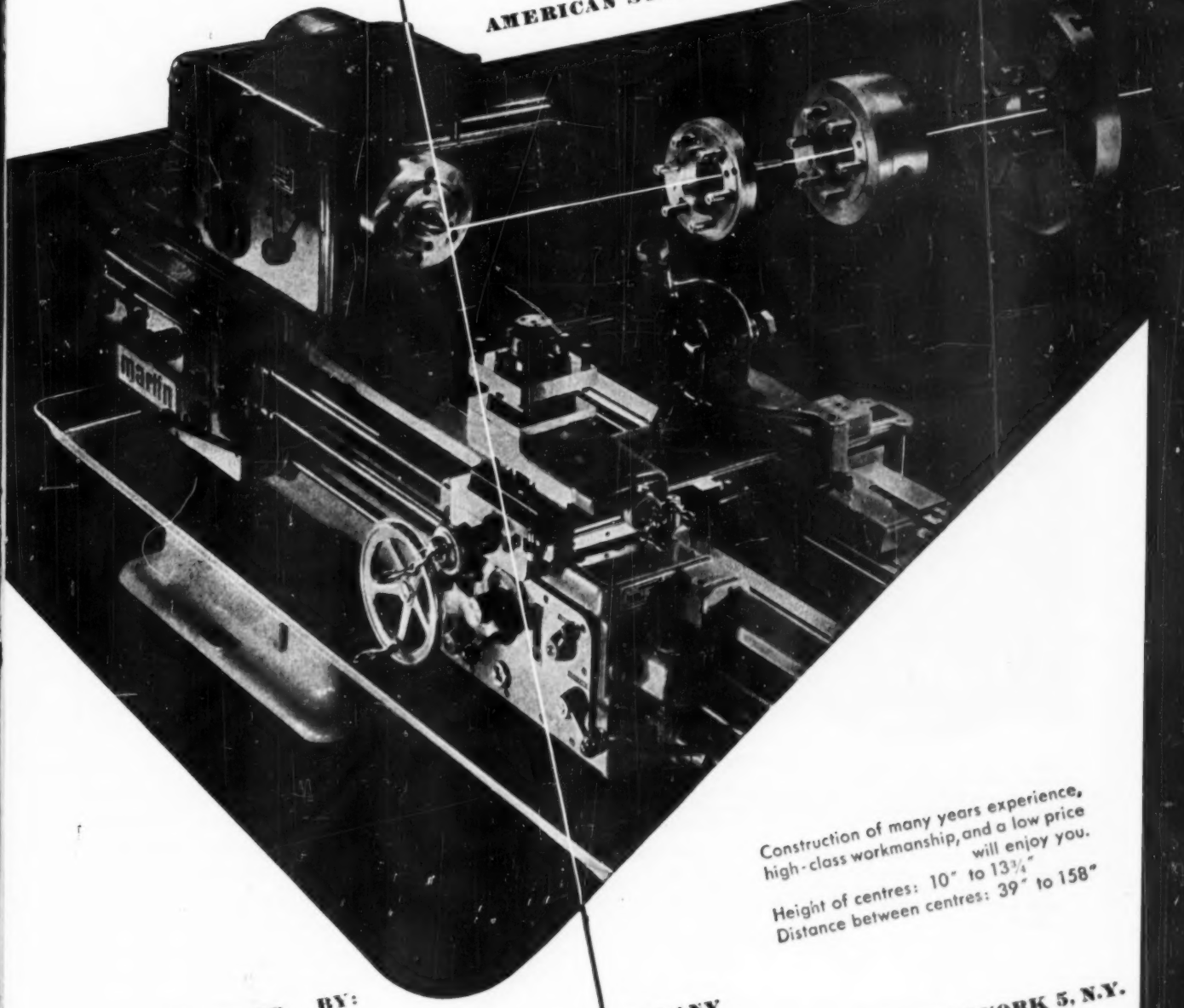

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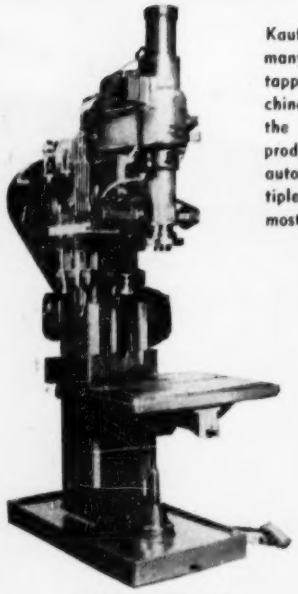

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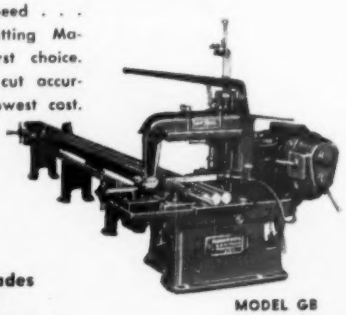

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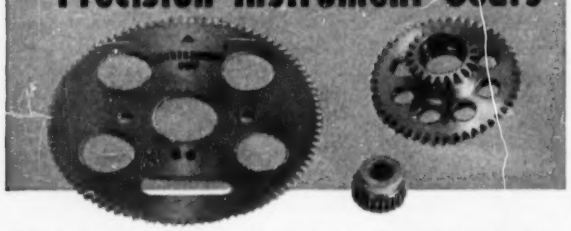

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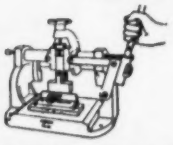


WITH THE MODEL 9A MARKING MACHINE, COMES IN HAND, MOTOR AND AIR DRIVEN MODELS.

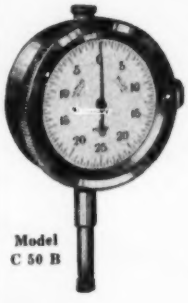
If you make precision parts you need the 9A machine.

ACROMARK Company

7-13 MORRELL ST., ELIZABETH 4, N. J.

Details soon on a great new service to all *American Machinist* subscribers . . .

The 1954 PRODUCTION PLANBOOK for Metalworking



Model C 50 B

RANDALL and STICKNEY Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2¼" overall diameter, balanced dial 0-25-0 with .0005" graduations, ½" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1896

Carl Rosen, President of Puritan Dress Company, tells how . . .

He leads the world's biggest dress parade!

"Fashions are perishable," says Carl Rosen, head of the world's largest women's dress house. "The season is short – *speed* is the essence.

"First we test new styles in key markets to see how they click. New dresses reach the stores on time – via Air Express.

"Then we release the best styles, timed to go on sale when our 2-page ads appear in Sunday papers all over the country. Those dresses reach every part of the nation overnight – via Air Express. Finally, our efforts pay off in a flood of reorders!

"And again we turn to Air Express, to replace stocks as fast as they sell out. This dependable speed is the lifeblood of our business. It is absolutely essential to us.

"Yet the majority of our Air Express shipments go at *lower rates* than any other commercial air service.

"Buyers and salesmen know they can depend on us. We depend on Air Express!"

It pays to express yourself clearly. Say Air Express! Division of Railway Express Agency.

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

METAL IS REMOVED

by the abrasive stones which produce chips from dust to curly chips as long as six inches.

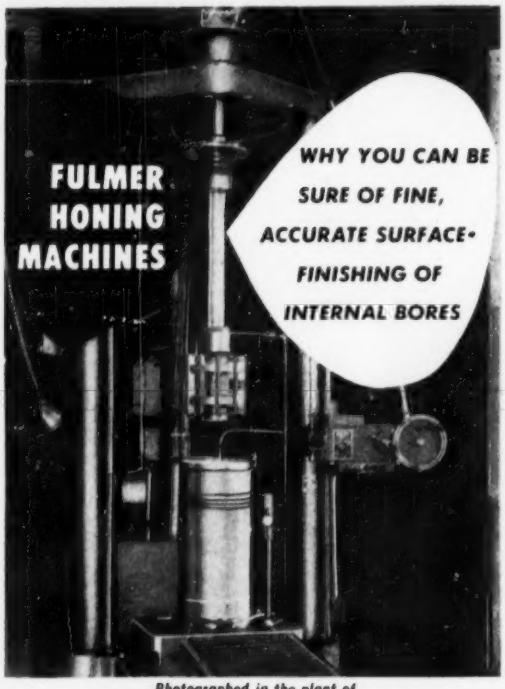
ACCURACY IS GUARANTEED

because all surface irregularities are eliminated to tolerances as close as .0001 (±).

REMOVE

as much as 1/6 inch at 1½ to 2 cu. in. per min. for ferrous and non-ferrous metals, glass, plastic, etc.

SURFACE FINISH OF AMAZING SMOOTHNESS



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results from the self-sharpening abrasive which will not smear or distort the surface and produces a uniform finish for all parts of the bore. Identical finishes may be duplicated by the same honing setup. Any degree of roughness may be attained from 1 to 100 micro-inches rms.

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Anyone can do it . . . with a

***Black Diamond* precision DRILL GRINDER**

- One operation grinds both lips
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How to estimate the time element in any machining job

Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

Machine Shop Estimating

BY W. A. NORDHOFF
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486 pages, 486 illus., $7.00

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine shop large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job-time.

It covers every step—from setting up a job, to tearing it down—giving the specific time value established for each element. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating particular jobs on each type of machine in use today.

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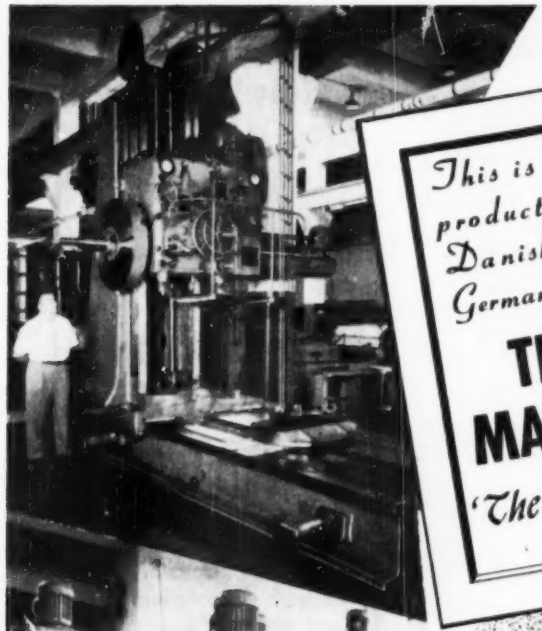

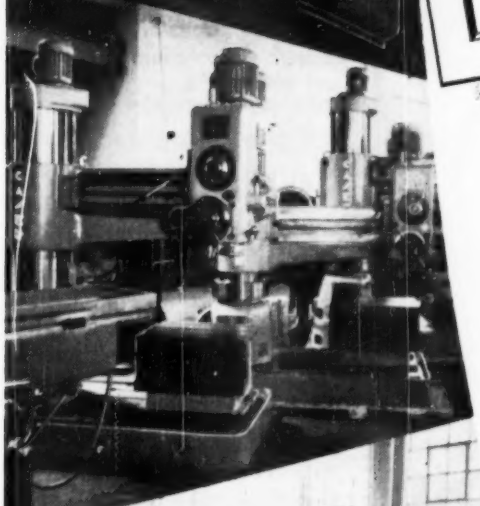

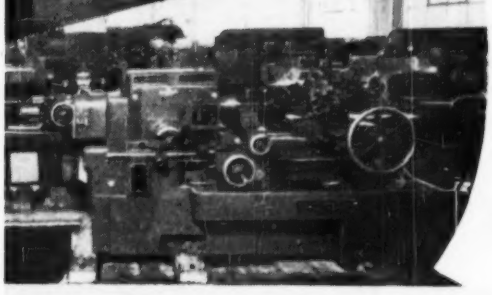

This is your Invitation to inspect the finest products of leading American, English, Danish, Dutch, Austrian, Italian, French, German and Swiss Machine Tool Builders at

THE 1st INTERNATIONAL MACHINE TOOL EXPOSITION

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Over 1000 Machine Tools to be Displayed Under Power in 200,000 Sq. Feet of Exhibition Space

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Rough balancing increased from 3.1 to 9.6 per hour
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Locate unbalance in your rotating parts this fast, simple way

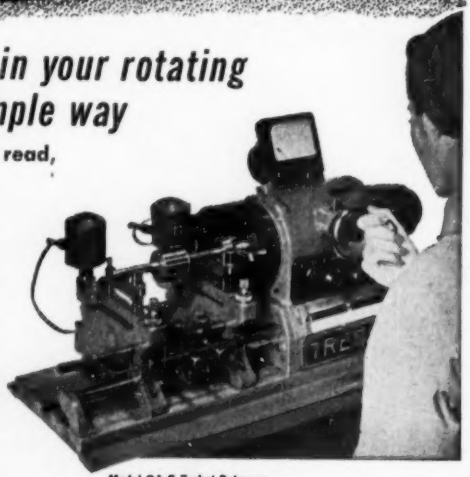
Takes less than a minute to read, 2 minutes to set up.

No special skills are needed to detect the *unbalance* that causes *vibration* in rotating parts . . . when you use the TREBEL DYNAMIC BALANCER.

The unique TREBEL dynamic balancing principle applies a variable counter-vibration to counteract unbalance vibration. Direct readings in ounce-inches give the *amount* of unbalance without further calibration; readings in degrees show *location* of unbalance.

That's why so many leading plants use the TREBEL.

Write for Catalog "A" or see a demonstration in your own plant.



Model 2b5 Trebel Balancer
Weight capacity 2½ oz. to 4½ lbs.
Max. work diameter 7"; length 18"
Accurate within .000025" displacement of center of gravity
Other Trebel models for work up to 22,000 lbs. and 98½" OD.

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The 1954 PRODUCTION PLANBOOK for Metalworking

will be coming your way in November. Watch for details of this great new service to you.

American Machinist
330 West 42nd Street
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How to choose and use

Automatic Lathes

• Versatile, as well as fast, the automatic lathe is capable of performing a large number of operations . . . turning, facing, chamfering, boring, and contouring.

How to Choose and Use AUTOMATIC LATHES

16 pages—25 cents

This *American Machinist* Special Report, tells you how to obtain greater output and lower costs in the operation of your single-spindle units.

• Abundant with instructive photographs and drawings, copies of this report are available at 25 cents each.

• Similar Special Reports on the following topics are also available.

MULTI-SPINDLE BAR MACHINES

16 pages—25 cents each

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AUTOMATIC TURRET LATHES FOR CHUCKING WORK

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READER SERVICE DEPARTMENT

American Machinist
McGraw-Hill Building
New York 36, N. Y.

Are machine tool "tapeworms" eating up your maintenance dollars?

Don't tear the hide off your plant engineer every time maintenance costs surge high. Check into your machine tools *first*. Chances are that "tapeworms" lurk deep inside their gizzards—draining your plant production system, eating up your maintenance dollars.

Extricate machine tool "tapeworms" with Engineered Rebuilding

Factory Magazine reports that two out of every five plants review their equipment. It's the first step towards rebuilding. It's the only way to pinpoint your troubles, halt breakdowns of machinery that account for so much of your downtime, wipe out uncountable costs in repairs and new equipment.

Break down your maintenance costs by machine tools

Factory says this is being done today by three out of ten plants, indicating it has a lot of value. Obviously, there's still plenty of by-guess-and-by-gosh among the other plants. If you ever want to isolate this major drain on your maintenance budget, *now is the time to start.*

Report those progress checks

Top management needs this information to pull a machine tool for rebuilding *when the tool needs it—before the heavy expense starts.*

Exactly what is Simmons Engineered Rebuilding?

It's *complete* rebuilding and modernization "from the ground up." It includes dismantling down to main castings, thorough cleaning, testing of all bearings, replacement of worn parts, rewiring of electrical circuits…plus the introduction of up-to-the-minute features that enable the machine to operate at an even *higher* capacity than when it was brand new. The rebuilt and modernized machine tool is "witness-tested" on the Simmons plant floor. A Simmons service engineer checks its performance with your inspector under actual working conditions; OK's it only if its productive capacity equals or exceeds its original capacity when new.

Simmons Engineered Rebuilding delivers *guaranteed* satisfaction, delivers it faster and at bigger money savings, especially on the larger-type tools.

Cut your maintenance costs with this simple plan:

1. On your next maintenance check, note especially those complex, hard-to-replace machine tools. Are they operating as well as they might?

2. If not, list the ones you can temporarily spare.

3. Send us this list of machines. We'll promptly quote prices and deliveries. And you'll receive our fact-packed periodical, THE SIMMONS WAY.

SIMMONS MACHINE TOOL CORPORATION
1739 North Broadway, Albany 1, New York
New York Office: 50 East 42nd Street
Phone in New York: MUrray Hill 2-5941
Phone in Philadelphia: VIctor 8-3133
Phone in Pittsburgh: PEnhurst 1-3700

TSUGAMI

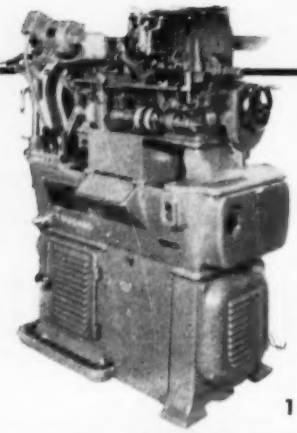
—MEANS PRECISION—

1 AUTOMATIC SCREW MACHINE
Model T-A5. OOM
Capacity: Round Bar ½", Maximum Length ¼". All parts interchange with OOG. B & S Priced under similar existing machines.
Price, $5,950

2 THREAD ROLLING MACHINE
Model T-ROL-5D
Capacity of thread to be rolled—maximum diameter 1⅛", minimum diameter ¼", Maximum length of rolled part 2¼". Pitch—50 to 12 T.P.I. will go up 2" and 4" long. Fully hydraulic—Class 4 thread can be rolled. No cams.
LOWER IN PRICE—MORE EFFICIENT than any existing machines. U.S. Standards.
Price, $5,750

3 PRECISION CYLINDRICAL GRINDER
Model T-BG 150
Capacity 1⅜" diameter x 5⅛" length, ⅛" minimum internal diameter. Similar to Crystal Lake only lower in price. Guaranteed to grind to 0.00008". Internal attachments available
Price, $2,725

All can be seen in operation at any time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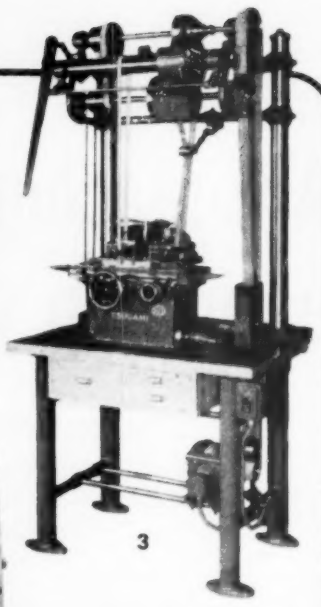
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Commercial Commodities Co., Pasadena, Calif.
Exclusive Importers of Tsugami Machines.

BRADLEY MACHINERY CO.
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TELEPHONE:
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Metal Saw Sharpeners
(Hot and Cold Saws)

Two Views of High and Low Toothed Metal Cutting Saws.

For Automatic Grinding of Cold Metal Saws.
Rigid — Accurate — Fast.
Ball Bearing Mounted Head Slides.
Heavy Duty Construction Throughout.

For inserted tooth, segmental type, solid tooth circular saws made in three sizes — Models 1130, 1160, 1172. Saw capacities 8 to 72 inches and larger.

Other Models — *Hot* and *Cold* Saws, No. 12 and No. 572 (all sizes).

HANCHETT MANUFACTURING COMPANY
World's Largest Manufacturers of Shear Blade, Knife and Saw Grinding Machinery
MAIN OFFICE — Big Rapids, Michigan **WEST COAST — Portland 4, Oregon**

Clark ADJUSTABLE HOLE CUTTER

Finished cuts the first time in boiler plate, plastics, hard fibre, pipe, stainless steel, Transite, etc. 7 models cut variable expansions from ⅜" to 5" holes, with thickness capacities from thin sheets to 1".

SPECIFICATIONS

MODEL NO.	SHANK SIZE	EXPANSION CAPACITY	THICKNESS CAPACITY
00	⅜" SS	⅜" – 1¼"	1/16"
0	½" SS	½" – 1½"	⅛"
1	½" SS	1" – 2½"	⅛"
2	MT	1½" – 3"	⅛"
3	MT	2" – 3½"	5/16"
4	5 MT	2½" – 4"	¼"
5	4 MT	3" – 5"	1"

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CLARK CUTTERS
Robert H. Clark Company
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SENIOR MANUFACTURING EXECUTIVE

Wanted by long-established, progressive, expanding midwest manufacturer (not dependent upon government contracts) to assume high level responsibilities. Products are of high quality and include large number of standard and semi-standard assemblies made from small parts. Salary $20,000 or more, plus other benefits.

Candidates must be mature graduate engineers with strong recent responsible manufacturing experience; have experience in labor relations, know automatic machinery, and be accustomed to controlling complex production programs.

This is an unusual opportunity. Replies (*full* details, please) will be treated in full confidence by reputable management consulting firm. Address:

GRIFFENHAGEN & ASSOCIATES
333 No. Michigan Ave., Chicago, Ill.
Attention: Mr. Larson

DESIGN AND PRODUCT ENGINEER

25-32 years of age with three to five years' experience designing mechanisms or semi-automatic machinery. Will be responsible for design, development, construction, and testing machines to change manufacturing process. Does not require knowledge of precision or high-speed equipment.

P-9087, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

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Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

HELP WANTED—Supervisor for machining department of manufacturer in metropolitan New York area to supervise primarily threading department of about twenty men. Most threading machines are of pottstoen make. Experience does not necessarily have to be on such work but applicant should have general machine shop background and possible toolroom experience. Application must include complete detailed resume of experience. P-9077, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 43 years). Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dunn Bldg., Buffalo 2, N. Y.

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PRODUCTION — METHODS — Process — tooling engineer—Thirty year background. Proven executive ability. Available October fifteenth—Salary commensurate with experience and ability—Travel—Relocate. PW-9033, American Machinist.

EXECUTIVE ENGINEER desires connection with medium size company to assume full responsibility as Production Manager, Chief Engineer or Staff Assistant. 25 years of unique practical design, manufacturing and sales experience in the automatic machinery and precision instrument field. Thoroughly familiar with engineering and developing new products, cost conscious, capable organizer. Age 51. College Graduate ME. Present Salary $15,000—plus bonus. West Coast Location preferred. PW-9107, American Machinist.

AVAILABLE — CHIEF DESIGNER

Twenty-five years experience. Successful household appliances, industrial electromechanical devices, aircraft actuators, synchros, servo motors. Administrative ability.

PW-9091, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

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(Classified Advertising)

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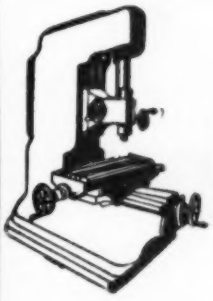

SEARCHLIGHT Equipment Spotting SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and surplus new metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

Just send in the specifications of the equipment wanted on the coupon below, or on your own company letterhead, to

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., N.Y. 36, N.Y.

Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., New York 36, N. Y.

Please help us locate the following used equipment:

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

9/14/53

(Additional Position Vacant Advertisement on page 408)

IT DOESN'T REQUIRE A SAGE!

● No—a Sage is not necessary to predict the potential of a Motch & Merryweather rebuilt machine both production-wise and as to accuracy of product.

The reason for this lies in Motch & Merryweather's professional selection of good used machine tools—rigid standards of shop procedure—a competent engineering organization—skilled, experienced mechanics—rigid tests of rebuilt machines under power—and a strict final inspection.

Due to our commitments for rebuilt machines for National defense over the past couple of years, it has been impossible for us to stock but a limited number of used machines for civilian consumption. However, the pressure on defense orders is gradually tapering off and in the not-too-distant future we will have a greater number of quality used machine tools available.

MOTCH & MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT
CINCINNATI PITTSBURGH

Play it safe—Consult Motch & Merryweather first on your used and rebuilt machine tool requirements.

USED MACHINERY DIVISION 1250 EAST 222ND STREET EUCLID 17 • OHIO

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A modern and progressive Forging Company has an opening with an exceptional opportunity in a Key Position.

He must have these qualifications: practical experience and fundamental knowledge of drop forge methods, with creative ability to develop improved techniques. Should have had successful administrative, supervisory and labor relations experience. Sound character and good personality. College degree in engineering preferred. Age 30 to 40.

This is not a replacement job, but a new position for a high-grade man in an expanding organization. Good salary and bonus. Location: Michigan.

For an appointment or correspondence, furnish full description and qualifications, which will be held confidentially.

Reply to

P-8888, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

FACTORY SUPERVISOR

To have tool and die shop background. For plant under 35, manufacturing name plates, badges and marking products.

P8226 AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them

GENERAL PATTERN WORKS
2233 Burk Street Cincinnati, Ohio

MACHINERY WANTED

1 Monarch engine lathe 12 inch swing with minimum 3 feet between centers.
1 Monarch engine lathe 16 inch swing with minimum 4 feet between centers.
Must be less than 3 years old and comparable to new equipment.
1 Gould and Eberhardt Hobber 24 inch.
1 Gould and Eberhardt Hobber 36 inch.
1 Gould and Eberhardt Hobber 48 inch equipped with differential and preferably with tangential feed.
Must be in excellent condition. Write giving serial # age and price.

W-8864, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

CAN YOU USE HELP ON PRODUCTION TURNING?

Manufacturer has open time available in chucking department, on automatic turret lathes and eight spindle Bullard mult-au-matics.

Send prints for estimates or comparison on present costs.

CW-8339, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

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MACHINE TOOL REBUILDING

Renewed life at a fraction of New Cost

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OSWEGO, N. Y. PHONE 1763

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LATE MODELS—HARD TO FIND

American Engine Lathe, Heavy Duty, 20" x 48", Geared Head, Metric
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Pratt & Whitney, Model B, 60" x 60", Thread Miller
1-18 Cincinnati Horizontal Miller
(4) Coes ⅜" Cap. Automatic Screw Machines
#60 New Britain Gridley Automatic Screw Machine
#304 Bliss, S.S., Press, 57 tons, 8" stroke
#60 Whiting "Quickwork" Rotary Shear, 1" cap. 48" throat
Model 3AS Buffalo Angle Shear
#300 Hanchett Horizontal Hydraulic Surface Grinder
Type C Landis 10" x 18" Cylindrical Grinder

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AUTOMATIC, 0G Brown & Sharpe Hi Speed, M.D.

BALANCER, Anderson Bros. 14"x64", Rote-Checker.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 2½" Lucas Horiz. M.D.
BORING MILL, Lucas Horiz., 3" Bar, M.D.
BORING MILL, Giddings & L #0 Horiz. 3½" Bar.
BORING MILL, 100" Niles B-P M.D. 2 swivel hds.
BARRELS, Tumbling Lupomatic, Schutte & Koerting.
BRAKE, #335 Chicago, M.D., Press, 6' 15 ga., NEW.
BRAKE, #185 Chicago Power Apron, 8'x3/16" cap.
BROACH, La Pointe 5 ton, 36" stroke, #1 Late

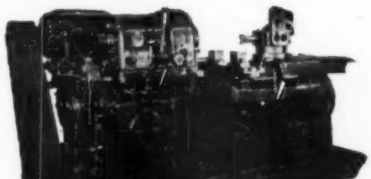
COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP, M.D., 10x10, 278 CFM.
COMPRESSOR, Ing.-Rand ER-1, 100 HP Syn. M.D.
CRANE, OET Ricker 2 tons 11'8" span.
CRANE, Canton #2 Portable Gooseneck 3 ton cap.

RADIAL DRILL, 3' 9" Mueller, M.D.
RADIAL DRILL, 3'x11" Canady-Otto, M.D., Late.
RADIAL DRILL, 4'x11" Cincinnati Bickford, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 30" Walker Turner M.D., Late.
DRILL, Foodick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2 M.D.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16"
DRILL, 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Natco Multiple Spdle C5, 10 Sp., M.D.
DRILL, Natco Multiple Spdle #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S. #4 M.T., 1¼" cap.
DRILL PRESS, #25 Foote-Burt S.S., 24", #3 M.T.
DRILLS, #14, #15, #18 S.S. Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNETIZER, SB-811 Magnaflux, late type.

FACING HEADS, 20" & 24" Mummert-Dixon.
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, Type P4 Oliver Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100°F cap.

GRINDER, M.D. Sanford Surf. 8"x12" cap., New.
GRINDER, #1 Wilmarth Morman Hand Surf., 6"x12".
GRINDER, #2 Imperia Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 18" Dble End.
GRINDER, Heald Rotary #25, M.D. 15" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drill-pointer, #51.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4¼".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterholm Disc. 24" cap.
GRINDER, 30" Ingersoll Tub Face Mill, M.D.
GRINDER, #79, 72" Gardner Vert. Spindle, Late.
GRINDER, #214—30" Besly Double End Disc, Late.
PROFILE GRINDER, Studer Type PSM, M.D., late.
GEAR LAPPER, #8LS, #13LSI Fellows, Outboard Supports. Detachable Lapheads, Late.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

HAMMER, Rochester Hispeed, all sizes, M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.D.D. Cold 3/16".

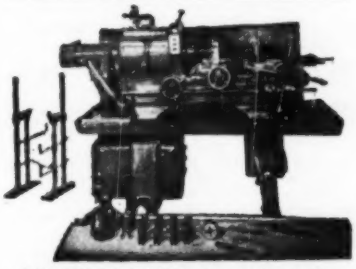


4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

INDUCTION HEATER, 16 KVA Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head. Bar Feed, 4" capacity through spindle. Late Type, Motor Driven.

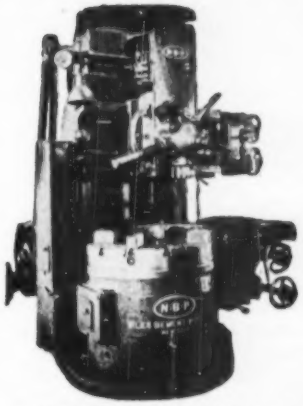


#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, La-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type.
LATHE, LeBlond 14"x6', Q.C.G., M.D.
LATHE, Hamday 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, American 16"x8' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x10' Axelson Grd., Late, M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late.
LATHE, Putnam 23/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd. Hd., M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x18' Pittsburgh Geared Head, M.D.
LATHE, Bulling Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W. & S. Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, No. 1½ Milwaukee Plain Horiz.
MILL, #4 Burke Motor Driven, Late, M.D.
MILL #0-8 Cinc. Vert. Prod. Rotary Table
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3VB Hardings Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
MUIT-MILLER, U.S. Tool #MM-1-6 Auto. Prod.
MILL, No. 0 Brown & Sharpe Plain Horiz.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd. Late Type. Vert. Hd.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical Hi Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, 42"x96"x17" Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, #136 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 16—48"-54" Morgan, Late.

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niles Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill. Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #6 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 79 & 90 tons, New.
PRESS #24 Walsh OBI 24 tons cap., Late.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #19, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 68 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles Bement Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hesker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Ggle. End. 24" Thr. 1" thru 1".

RIVET SETTER, ⅜" cap. Penn. Tubular Rivet.
ROLLS, Bertsch Pyramid 18"x1¾" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x1¼" Lawn Initial M.D., New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Radiac "11" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW #8 Marvel Bandsaw, 18"x18" cap.
SAW, #4B Marvel Hack Saw 6"x9" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, 10"x10" Racine Hydraulic, Late Type, M.D. #30C
SAW, Band Tannewitz GH-36" High Speed, M.D.
SAW V-26 DoALL Bandsaw, Late
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Tab'e.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci., B.G., Motor Driven, H.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model GT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER MACHINE, Type UK300M.
BRINELL TESTER, Type 030R, Steel City.
WELDER, 500 amp. Westinghouse Flexarc A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Acme, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE IN STOCK

MODERNIZE for ECONOMY — with MOREY

1000 LATE TYPE TOOLS IN STOCK

DRILLS, Miscellaneous

ALLEN No. 3, 4-sp, 4 motor dr., No. 4 M.T., late
AMERICAN 4' arm 11" col. "Hole Wizard" with
BULLARD 30"x20" Man-au-trol Spacer table
BARNES No. 420 Deep hole; late
BARNES H2 Hydram, cap. 2" No. 5 M.T., hyd., late
BARNES 20", 4-spindle Camel Back, No. 4 M.T., power feed, late type
CINCINNATI 21" round column, M.D. late
LELAND & GIFFORD No. 1 LMS; late
MOLINE 6-sp. Mult. Hole-Hog; 3½" dia. M.D.
NATCO No. 14 Mult. Rect. Head; PRT; M.D.

DRILLS, Radial

AMERICAN 5' arm 13" column, Universal, M.D.
CINCINNATI BICKFORD 6' arm 15" col. Un. M.D.
CINCINNATI BICKFORD 4'x17", M.D.
KITCHEN & WADE 4' arm 12" col., Plain, M.D.

GRINDERS, Internal

BRYANT, No. 3 and 5 Internal; hydraulic; late
BRYANT No. 16-C-16 Internal; hydraulic; late
BRYANT No. 24 Internal; hydraulic; late
CHURCHILL No. 3 Internal; 8" stroke; late
HEALD No. 70A Internal, M.D., late
HEALD No. 81 pt. chuck type, Internal; M.D.
HEALD No. 72A3 and 72A5 Plain Internal; late
HEALD No. 72A5 "Gagematic" Internal; late
HEALD No. 78 Internal, centerless, M.D.

GRINDERS, Cylindrical, Plain & Universal

BROWN & SHARPE No. 3 Universal; late type
BROWN & SHARPE No. 5, 3"x12"; Plain; late
LANDIS 10"x18" type "C" Plain; hydraulic; late
LANDIS 16"x36" Pl. Cyl. type "D", Hydraulic; late
NORTON 10"x48" type "C" Hydraulic; Pl. Cyl.; late
LEMPCO 22"x72" Model KG Crankshaft; late
VAN NORMAN No. 666, 48" centers, crankshaft;

GRINDERS, Surface

ABRASIVE No. 34, 8"x24" table; late type
ARTER 8" Rotary, motor drive
BILLITER & KLUNZ 48"x196" Way, Grinder; M.D.
HEALD No. 22 Rotary, 12" chuck; M.D., late
NORTON 6"x18" Vertical Spindle; late type
PRATT & WHITNEY 14"x36" Model "B"; late

LATHES—Turret

GISHOLT 2L High Production, Timken, M.D., late
GISHOLT 1L Univ. Saddle Type; Timken; M.D. late
MOREY No. 2, ram type TIMKEN; late
WARNER & SWASEY 2A Pre-selector head, late

MILLING MACHINES—Thread

HALL Style D Planetary; late
LEES BRADNER model HT, 12"x36" centers, late

MILLING MACHINES—Plain

CINCINNATI 1-18 Automatic; Timken; late type
CINCINNATI 4S High Power; Timken; late
CINCINNATI #4, PRT, Timken; late
KEARNEY & TRECKER Mod. 2HL, M.D., late
KEARNEY & TRECKER 4H Plain, Timken, late
KEMPSMITH #4 Plain Maxi-Miller; late
ROCKFORD #3 Rigid Mill, motor drive.
STARR #2 table 13"x55", late type

MILLING MACHINES—Universal

CINCINNATI #3 dial type, timken, M.D. late
RICHMOND #2 light type, late

MILLING MACHINES—Vertical

CINCINNATI 0-8 vertical; timken; late type
KEARNEY & TRECKER 3H Vert., timken, late
KEARNEY & TRECKER 3K, H.S. timken, late

TAPPING MACHINES

BAUSH No. 1 Radial Tapper, late type
WATERBURY FARREL No. 2 Automatic Nut Tapper, late type

MISCELLANEOUS

BAKER No. 5 Keyseater; motor drive
BARNES No. 172, 214 Honing; M.D., hydr.; late
EX-CELL-O model 112C Borematic; late single end 2-spindle
FISCHER No. 1 Oil Groover; M.D.; late
GORTON 3K Precision Matrix Engraving, late type
LANDIS 2" Double Spdle. Threaders
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type
MANVILLE No. 3 Bolt Head Trimmer, M.D.
MANVILLE 2C, Screw Slotter, Motor Drive
MANVILLE No. 1, Screw Slotter, Motor Drive
MANVILLE 3C Thread Roller, Motor Drive
MODERN No. 3 Cut Off Machine, late type
NATIONAL No. 1½, Wire Nail Machine; NEW
SAUNDERS 8-18" Pipe Machine, M.D.
SCIAKY Type RMCO 45-10 Elec. Spot Welder
HUGH SMITH 1"x24'6" Plate Bend. Rolls; M.D.
WATERBURY FARREL #10 Thd. Rollers, M.D.

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28"x15' centers BERTRAM (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC-MD, new 1943.

36"x12' centers AMERICAN Heavy Duty 16 Speed Geared Head Lathe, AC—MD

60"x20' NILES-BEMENT-POND Geared Head Engine Lathe, rapid traverse.

No. 2 WARNER & SWASEY Hand Screw Machine, geared head, power feeds, AC motor in base, Timken spindle.

No. 4L GISHOLT Turret Lathe, 1945.

61" BULLARD Maxi-Mill, Vertical Boring Mill, 2 swivel heads on rail, power rapid traverse, 20 HP AC motor drive.

42" BULLARD, Vertical Boring Mill, extra high column, Serial No. 12938

No. 2 CINCINNATI Vertical Mill, dial type, new 1945

No. 3-24 CINCINNATI Plain Hydromatic Mill, AC-MD

No. 4 KEARNEY & TRECKER Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse.

No. 4 CINCINNATI Hi-Power Vertical Mill, No. 50 taper, power rapid traverse, AC motor

No. 4H KEARNEY & TRECKER Vertical Mill, new 1944

5" bar KEYSTONE Horizontal Boring, Drilling & Milling Machine, floor type, 14' horizontal travel of column on runway, new 1942.

48"x48"x10' NILES Double Housing Planer, box table, DC reversing motor drive.

48" widened to 69" x 12' DETRICK & HARVEY Double Housing Planer, box table, DC reversing motor drive

No. 2 BROWN & SHARPE Surface Grinder, motor inside base, power feeds.

25A HEALD Rotary Surface Grinder, 24" diameter magnetic chuck, AC-MD.

14" x 48" MATTISON Hydraulic Surface Grinder, magnetic chuck, AC motors, 1940

36" OHIO Dreadnaught Shaper, AC-MD.

1½" LANDIS Bolt Threader, leadscrews, AC-MD.

30" MORTON Hydraulic Keyseater, new 1942

600 Ton CHAMBERSBURG Wheel Press, cast steel frame, inclined, AC-MD

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Late Type
27" x 16' between centers
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ELECTRIC FURNACE TO 1850°
with Auto Temperature Control. Sliding door. Cheap to operate. Substantial Dependable for Machine Shop, Tool Room.
8" x 12" x 15" inside 4.5 K.W. $250.00
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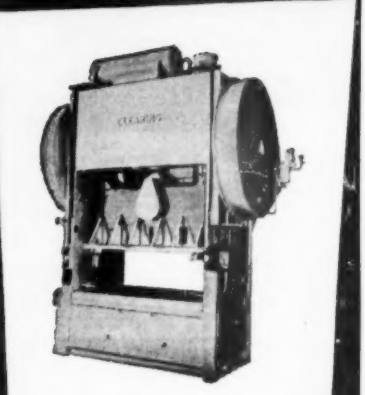

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W.F.F. Double Action Power Presses
#08 CINN. Vert. with Rotary Table
30" ESPEN-LUCAS Hydraulic Cold Saw
¼" MANVILLE #1 D.S.S.D. Header
#2A WARNER & SWASEY Turret Lathe
#1 W.F.F. Screw Slotters
10 x 24" HANSON - WHITNEY Univ. Thread Miller
#2 B&S Univ. Grinders, C/S, Tooling
HASKINS #2 Cam Tapper, Index Fixture
#4 TORRINGTON 4 Die Swager
Numerous Other Machine Tools
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NEARLY NEW (1948)
GLEASON #7 HYPOID CUTTER SHARPENER Ser. #24768. Hand Index, Hand Feed Coolant.
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OUTSTANDING OFFERING
CLEARING 500/1500 Ton Hydraulic Press, 25½" x 24" stroke down-moving ram, 43" x 52" bed area, 54" daylite, completely self-contained. Inspection under power.
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ATTENTION EXPORTERS
Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.
FS-1633, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

FOR SALE
1—Heald Sizematic, completely rebuilt by the Heald Machine Company within the last 90 days, serial No. 6887.
FS-8821, AMERICAN MACHINIST
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1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

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VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle

GEAR CUTTING MACHINES

CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gecar
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10" x 24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

3-WAY GUARANTEE

1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL

BRYANT: 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

THOMPSON: Hydr. Surface Grinder, 10 x 18 x 24" New

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY: 1A, 2A, 3A & 4A
WARNER & SWASEY #3, #4 & #5 Turret Lathes
HERBERT: #2, #4, #7, and #8 No. 9B/30 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI Hydromatic Duplex, Rise-and-Fall, 34-36 Tracer Control
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
EES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole.
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

ARTER CARBIDE Tool Grinders
OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used.
AUTOMATIC SCREW MACHINE, Swiss type, ⅜"—used
AUTOMATIC SCREW MACHINE Wickman, Single Spindle, 7/16", New
CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe 12" dia. x 48" centers
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

RELIABILITY has been earned by
WIGGLESWORTH MACHINE TOOLS

AUTOMATICS
2⅝" Cone 4 spdle., well equipped, 1936.
#24 New Britain 4 spdle. chucker, 2½" cap.
¾" Model F Gridley, 4 spdle.

2" 4 SPINDLE CONEMATIC, THREADING SPDLE., TAPPING ATTACHMENT, BAR FEED. CONSIDERABLE TOOLING. EXCELLENT CONDITION. 1943

BORING MILL
36" Bullard New Era, rail & side head
42" Bullard New Era, rail & side head

GRINDERS
16x144" Thompson surface, chuck, 1950
10x36" Norton type C, mech. infeed, late
6x18" Reid, #2-I, power feed, 1939
#444 Van Norman rotary surface, 22" dia
#76RA Rogers knife grinder, 76", late
Cinn. Internal, 24" swing, 78" stroke
14" Hammond WD carbide tool, late
#104 Rivett Universal, 1942, rebuilt
#4 Bryant Internal, auto. sizing
#86—30" Gardner vert. disc grinder
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
P & W deep hole drill grinder, late
Model 1311 P & W contour, late

DRILLS
Type 14 Natco, 12 spdle., #4 M.T., inline head
#12 P & W, 9 spdle., #2 M.T., power feed
D-4 Colburn, #3 M.T., 3½" cap., 24" swing
Baker Hvy Dty, #3 M.T., p.f.
#2LMS Leland-Gifford, 26", hydraulic
#2 Allen, 2, 4, 6 spdle., #2 M.T.

GEAR MACHINERY
13LS Fellows lapper, late
7A Fellows, shaper high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES
Connel Dengler spinning, 20" swing, 15 HP
14x36" Carroll-Jamieson, g.h., chucks, 1942
42"x26' ctrs American, High Duty, 16 speeds
30"x10' American geared head, taper att.
48"x35' LeBlond Hvy Dty, taper, late
Gisholt Simplimatic, platen type, late

TURRET LATHES
#3 J & L Univ. bar feed, 2" hole, late
#5 B & O Univ., chuck, pre-selector, late
#1A W & S Univ., 3" hole. #417,756
#1L Gisholt Universal, 3" hole, 1937
Libby type H, 24" swing, 8 spdle, speeds
#2 Simmons Microspeed, air chuck, late
#3 Gisholt Universal, late
#4 W & S, bar feed, serial #342461
#4A W&S Univ., cross sliding turret, 1944

SHAPERS & PLANERS
30"x30"x17' Cleve. Openside
48x48x14' Detrick & Harvey dble. hsg.
26" Smith & Mills shaper, 4 step cone

MILLS
#2 B & S Vert., 7½ HP late
08 Cinn. horiz., rise & fall, 1943
08 Cinn. horiz., auto. cycle, 1943
#1½B K & T horiz., dble. overarm, rebuilt
10C Van Norman Contour
#3 Cinn. high speed dial type, vertical
#3 Cinn. high speed dial type, horizontal
#5B B & S horiz., round overarm, 16 speeds

THREADERS
#33 Excello plain external, late
#22 Murchey bolt & pipe, ½ to 2", late
8x16" Hanson-Whitney Universal, mill, late
6x80" P & W miller, splining & milling
#50 Excello Precision grinder, 28x68"
13" Automatic Machinery miller, late
LT636 Lees Bradner mill, 18 x 36", late
1½" Landis, 2 spdle., lead screw type
#31 Excello, diamond dresser, late

FURNACES
Whiting Converter, 2 ton cap., late
Model SP Juthe, gas, 1000° F

PRESSES
#37 Excelsior dble. crank, 45 ton
250 ton Elmes hyd. shell nosing, 21½" str.
Ferracute type EG-52 embossing, 150 ton
#4 Toledo OBI, 25 ton, 2" stroke

MISCELLANEOUS
MAGNAFLUX: MA-3 production type, 3000 amp.
WELDER: 75KVA Thompson Gibbs spot, 18" throat
TAPPERS: Haskins 2CAM, 5/16" late
Cleve. Model EO, ½", late
KEYSEATER: #6-38 Mitts & Merrill, 4 x 36"
WELDERS: Hobart and P & H Arc, 400 amp
BULLDOZERS: #2 Ajax High Speed, 30 ton
SAW: 34" Espen-Lucas, 1945

T. R. WIGGLESWORTH MACHINERY COMPANY
1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

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VERNIER HEIGHT GAUGES
SWEDISH MADE
ABSOLUTE ACCURACY GUARANTEED
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- Direct readings in .001" from surface plate.
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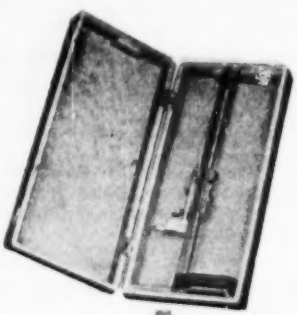
- All parts subject to wear are hardened.
- Now in use by many large plants throughout the United States.



ONE OF THE FINEST and sturdiest height gauges made. An ideal instrument for measuring and scribing off vertical distances, etc., and indispensable in making jigs and fixtures. All parts subject to wear are hardened, including height scale.

NOW AVAILABLE IN THREE SIZES

12 INCH DIMENSIONS	18 INCH DIMENSIONS
Measuring Range ... 0-12"	Measuring Range ... 0-18"
Length of scribing needle ... 2⅝"	Length of scribing needle ... 3⅜"
Size of foot plate 3⅞"x2⅛"x1-3/16"	Size of foot plate 5⅛"x3⅜"x1⅜"
Net wgt. 3½ lbs.	Net. wgt. 9 lbs.
Gross wgt. 5¼ lbs.	Gross wgt. 12 lbs.
$67.50 Each	**$140.00 Each**

24 INCH DIMENSIONS
Measuring Range ... 0-24"
Length of scribing needle ... 3⅜"
Size of foot plate ... 7"x4⅜"x1¾"
Net wgt. 13 lbs. Gross wgt. 19 lbs.
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All sizes supplied in handsome wooden case at no extra cost. Attachments for depth, and dial gauges are available.

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McDONALD
USED MACHINERY

Landis 20"x72" and 18"x96" Plain Ext. Grinders.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Red Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 13" hollow spindle.
Norton 6x18" Horiz. Hand Sur. Grinder 1941.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
20" All Grd. Camel Back Drill 1-Sp. and Barnes.
Amer. 3' & Morris 3½' Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf Grinder 26" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Ret. Surf. Grinder 12" chuck 1947.
Nazel #3-B Vert. Air Hammer A.C. M.D.
Landis 2-Sp. 2" Cap. Belt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Heald #70-A Red Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt # 25 Box. Col. 1-Sp. Hvy. Drill.
L & N, 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 28" stroke openside Shaper Planer.

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

No. 7 B & S High Speed Autos. M.D.
No. 25 Heald Rotary Surface Grinder.
P & W 30" Vert. 2-spindle Profiler.
Peerless 6½" x 6½" Hack Saw, hyd.

D. E. DONY MACHINERY CO.
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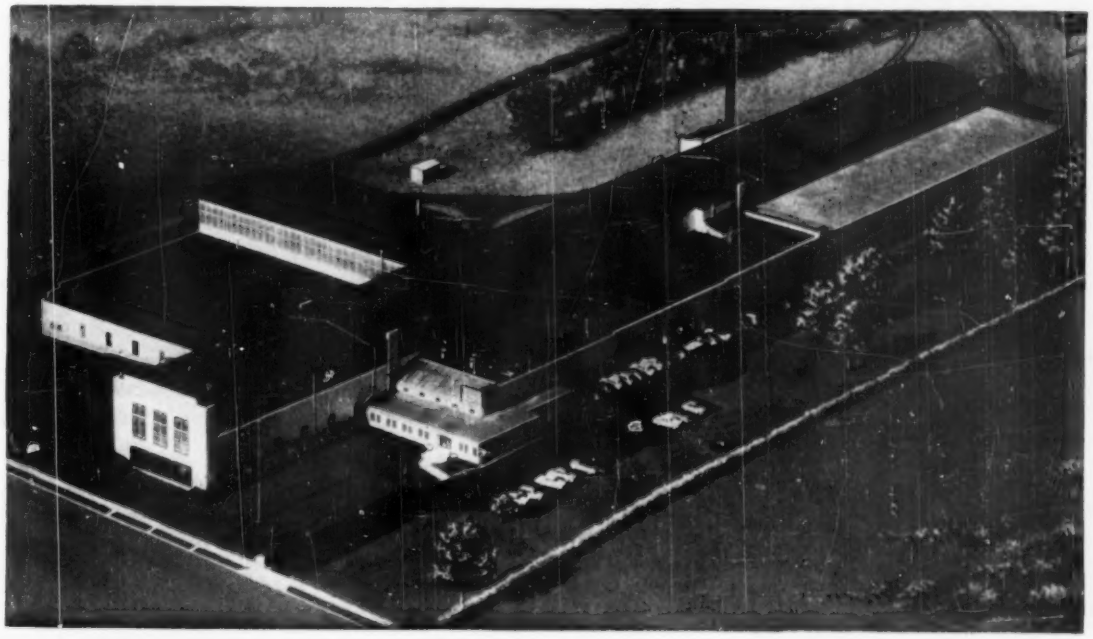
Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY



AUTOMATICS

9-16" Acme, m.d.
7/8" Cleveland Model B, belt
1" Acme, m.d.
1½" Cleveland Model A, belt
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
No. 8A Cleveland, m.d., 8" cap., latest
Model P—1-1 16" Cleveland, m.d.

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. 3/4" to 2" Nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type

HORIZONTAL BORING MILLS

Barrett Double End, 5" and 7" spindles, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Newton No. 2 Cylinder Borer, m.d.
10" bar Sellers, Floor Type, m.d.
Pair tables for use on Floor Type Horiz. Boring Mill, 8' long x 15¾" wide x 33" high, 2T slots
54"x11' Rectangular Table, 40" high
Pair tables 32" wide x 18' long x 10½" thick, Floor Plates, with 3 Tung Slots Floor Plate 6'11" wide by 9'1" long by 9¼" thick, 6 T slots

VERTICAL BORING MILLS

42" Bullard Spiral Drive, m.d.
42" Bullard New Era, m.d.
44" Putnam, m.d., p.r.t.
44" Niles, m.d., p.r.t.
48" Colburn, m.d.
53" Niles Heavy Pattern, m.d., p.r.t.
73" Niles, m.d., p.r.t.
100" Niles Heavy, m.d., p.r.t.
102" Niles Wheel Turning Boring Mill
12' Niles, m.d., p.r.t.
108" Cincinnati Vertical Hypro. Vertical Boring Mill

BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
Cincinnati Mill Broach, m.d., 10" spindles, new
12x72 Thompson Automatic Flat Broach, m.d.

RADIAL DRILLS

2½'-10" col. American Triple Purpose Plain, m.d.
3'-13" col. Cincinnati-Bickford Super-Service, m.d.
5'-13" col. American, gear box, m.d.
5'-15" col. American Triple Purpose, m.d. on arm
6'-15" col. American, box table, m.d.
7'-16" col. American Triple Purpose, m.d.
8'-17" col. Dreses, gear box, m.d.
8'-19" col. Cincinnati-Bickford Super-Service, m.d.
Zeus Precision Universal Bench Type Radials, m.d., new
Baush Radial Drilling & Tapping Machine, m.d.

BALL BEARING DRILLS

No. 15 Buffalo, Floor Model, m.d.
No. 18 Canedy-Otto Bench Model, m.d.
Providence Engineering Co., Model E, s.p.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2LMS—Leland & Gifford, single spindle High Speed, m.d., latest
No. 2MS Edlund, single spindle, m.d.
No. 4 Foudick, 5" overhang, belted m.d., No. 2 Taper
1 spindle Allen, belted m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 3 Allen, belted m.d.
2 spindle Avey, size No. 1, type B, style VHP, m.d., 8" overhang
2 spindle Avey, No. 2, 3, belted m.d., p.f.
2 spindle #2 Leland & Gifford High Speed, 8" overhang, m.d.
#1LMS—3 spindle Leland & Gifford High Speed, late, m.d.
3 spindle Leland & Gifford High Speed Model 3MS, m.d.
4 spindle Avey #1 High Speed, m.d., 7½" overhang, No. 2 M.T.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang
4 spindle Leland & Gifford, m.d.
6 spindle Leland & Gifford, No. 2 Taper, m.d. on each spindle
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper
6 spindle No. 1 Avey, belted m.d.
No. 4B-12 Edlund, m.d., No. 3 M.T.

HORIZONTAL DRILLS

Natco Horizontal Production Boring Machine, m.d., with D-11-HU heads
3 way Natco Horizontal Drill, consisting of 3 E13 Hole Units
No. ½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. ½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x105" Pratt & Whitny 2 spindle Deep Hole Drill, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
No. 1½ Pratt & Whitney 2 spindle, m.d., old type
Special Horiz. Drill Machine, Cinti. Bickford Head mounted horiz. on base

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK DRILLS, GEAR MACHINERY, GRINDERS, HAMMERS, HONING MACHINES, MFG. LATHES, ENGINE LATHES, MILLING MACHINES, PIPE MACHINES, PRESSES, PUNCHES & SHEARS, PLANERS, SAWS, RAILROAD MACHINERY, SHAPERS, SLOTTERS, TAPPERS, SHEET METAL MACHINERY, TURRET LATHES, ETC.

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For turret lathes, mills, grinders, saws, drills or wherever a soluble solution or light cutting is required.

FEATURES

5 gallon tank
Both feed & return lines
Filter screen on return
Positive control of solution
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Diamond 1-1440

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

2" Model A Cleveland. 1941.
1-1/16" Model A Cleveland. 1943.
No. 00G Brown & Sharpe. 1941.

BROACHES

HP-100 La Pointe Horiz. Broach. 1945.

DRILLS

3'-11" Archdale Radial. 1947.

GEAR EQUIPMENT

No. 7 Gleason "Revax" Rougher. 1943.
No. 6 Gleason Revacycle Generator. 1946.
No. 72 Fellows H.S. Gear Shaper. 1942.
No. 61 Fellows Gear Shaper. 1942.
10" Pratt & Whitney Hyd. Gear Grinder. '42
SG-11 Geargrind Spline Grinder. 1942.

GRINDERS

10"x18" Norton Plain Type "C". 1940.
6"x30" No. 12 B & S Hydraulic. 1940.
No. 72A-3 Heald Int. Extended Base. 1942.
No. 72-A3 Heald Plain Hydraulic. 1942.
No. 24-36 Bryant Hydraulic. 1943.
No. 16A2B Bryant Hole & Face. 1942.
No. 16 CP 16 Bryant Hydraulic. 1942.
No. 172 Heald Hydraulic. Gap. 1940.
No. 24D Hanchett Duplex Rotary. 1945.
No. 16A Blanchard Auto. Surface. 1942.
No. 2 Cincinnati Centerless Grinder. New 1944.
Cincinnati Centerless Lapper. 1942.
HRS Barber-Colman. 1942.
No. 35 Excello Precision Thread. 1942.
No. 7 Grand Rapids Universal. 1942.

GUN BARREL MACHINES

No. ½ B x 50 P & W Reamer. Latest.
No. ½ B x 30 P & W Reamer. Latest.
No. ½ B x 50 P & W Rifler. Latest.

LATHES, ENGINE

27"x192" Niles Timesaver. 2 Carr. 1941.
27"x96" Niles Timesaver. 1940.
26"x180" Betts Bridgeford. 1940.
26"x96" Betts Bridgeford. 1940.

LATHES, PRODUCTION

8"x84" Le-Swing Semi-automatic. 1941.
No. 3A Lodge & Shipley Duomatic. 1942
No. 1FU Foster Fastermatic. 1942

LATHES, TURRET

36" Bullard VTL, Spiral Drive. Late.
No. 1A Warner & Swasey Saddle Type. 1941.
No. 1L Gisholt Saddle Type. Late.
No. 2A Warner & Swasey Saddle Type. 1940.
No. 7A Jones & Lamson Saddle Type. 1943.
No. 3R Gisholt Universal Saddle Type. 1943.
No. H5 Libby Universal Saddle Type. 1939.
No. 5 Gisholt Universal Ram Type. 1942.
No. 4 Gishott Universal Ram Type. 1940.
No. 2M-59 Warner & Swasey Ram Type. 1941.

MILLS, BORING

No. 41 Lucas Horiz. 1941.

MILLS, PRODUCTION

No. 1048 Milwaukee Duplex. 1942.
No. 2-18 Cincinnati Automatic. 1942.
No. M-18 Milwaukee. 1943.
M-18 Milwaukee. 1943.
No. 3 Cincinnati Univ. Dial Type.
No. 08 CINCINNATI Rise and Fall. 1942
8x16 Hanson-Whitney Thread. 1939.

MILLS, TOOL ROOM

No. 3 Van Norman Plain. 1942.
No. 22L Van Norman Plain. 1943.
No. 2 Baimp Vertical New.
No. 2 Baimp Universal. New.
No. 3 Baimp Plain & Vertical. New
No. 4 Baimp Vertical. New

PRESSES

Verson 650 Ton Double Action. 1940.
No. 168½ Toledo Toggle.
No. 166 Toledo Toggle.
No. 67 Bliss Consolidated Press

SHAPERS

32" Ohio Heavy Duty Univ. 1951.
16", 20", 24" Gornetti Universal Shaper. New.

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. • • Indianapolis, Indiana

"LOOK THESE OVER"

4¼" ACME GRIDLEY Single Spindle Model L Automatic
3'11" DRESES Radial Drill—Motor on arm
16"x8' MONARCH Geared Head Lathe
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
No. 5A BRYANT Internal Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hydraulic Plain Grinder —1942
Nos. 4D & 6S POTTER & JOHNSTON Automatic Lathes
Nos. 8A and 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 26 VAN NORMAN Universal Miller
No. 2M CINCINNATI Plain Miller
No. 3 CINCINNATI Dial Type Plain Miller
No. 2 CINCINNATI HB Dial Type Plain Millers
No. 5 CINCINNATI Plain High Power Miller
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P&W Model C Thread Miller
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver 1943
No. 36BM GOULD & EBERHARDT Gear Rougher
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" H.D. Shaper.
100" BETTS Vertical Boring Mill, 2 heads.

WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St., Cambridge 41, Mass.

WORLD'S LARGEST INVENTORY

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MOTORS—GENERATORS—TRANSFORMERS
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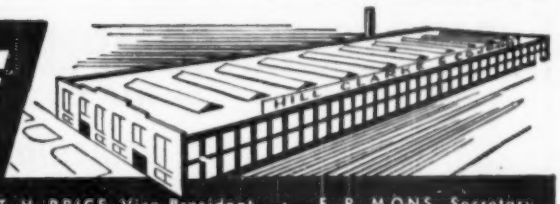
HILL-CLARKE MACHINERY COMPANY



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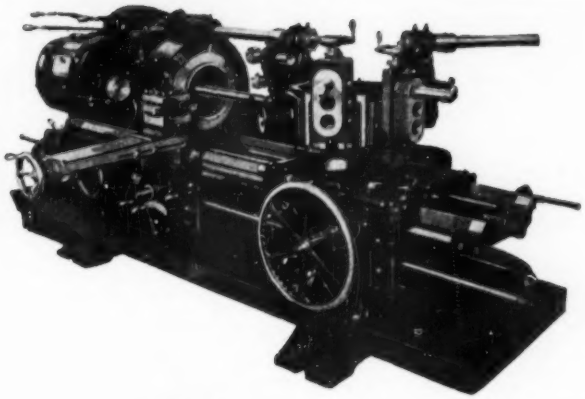

ABOVE:
4-A WARNER & SWASEY
UNIVERSAL TURRET LATHE
7½" Hole Through Spindle
Price: $6750

AUTOMATIC

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl.—14" Sw.—No. 2 Avey Cam Fd.
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl.—24" Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 64 Fellows Gear Shaper
No. 65 Fellows
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10" x 36" Norton Type C Cam. Grdr.
10" x 48" Norton type C (1943)
Hill-Clarke Cylindrical Grinders
10" x 36" centers
10" x 72" centers
18" x 96" centers
24 x 32 Gap x 144" centers
14" x 36" centers
14" x 72" centers
14" x 96" centers

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Gives You the Finest Re-manufacturing Obtainable

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18" x 96" centers
24" x 264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951) (9" swing — 1" bore x 3½" grind stroke)
No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

BORING MACHINES

No. 45—4½" bar G & L Hor. Bor.
100" Niles-B-Pond Vert. Bor., Mill

LATHES

16" x 33" R-14 Seneca Falls Auto. Lathe
18" x 6' American Geared Head Lathe
18" x 8' Lodge and Shipley
19" x 8' LeBlond Hvy. Duty Lathe
27" x 12' American Geared Hd. Lathe
27" x 12' centers LeBlond Lathe
36" x 18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7½" Hole Spdl.
No. 4A Warner & Swasey (1944)
No. 4A Warner & Swasey (1942)

MILLING MACHINES

No. 08 Cincinnati Vert. Mill (1942)
54" x 30" x 16' Ingersoll Slab Mill
6" x 168" Pratt & Whitney Thrd. Mill
10" x 48" Hanson-Whitney (1942)
10" x 60" Pratt & Whitney Thrd. Mill
12" x 102" Lees-Bradner Thrd. Mill

PLANERS

36" x 36" x 12' Cincinnati, 2 hds.
48" x 36" x 14' Gray, 2 hds.
48" x 48" x 12' Cincinnati, 2 hds.
60" x 48" x 27' American, 4 hds.

MISCELLANEOUS

1"-2" Cap. Micro. Model 200 Hor. Hone
¼"-1" Cap. Micro. Model H-2 Hor. Hone
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12" x 96" Magnetic Chucks
20' x 1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)

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5. A responsible organization — established 1867.

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AUTOMATICS
BROWN & SHARPE Model OG; high speed; serial #9427; (late).

BORING MILLS
BULLARD 42" Vertical Boring Mill; ser. #14,777; side head; M.D.
BULLARD Type "A" 8" Mult-Au-Matic; 6-spdl; serial #10884; M.D.

DRILLS
LELAND-GIFFORD No. 2LM8 2-Spindle; hyd. picker type feed; M.D. (Late).
BARNES 21" All-Geared; Self-Oiling; M.D.; Single Spdl.
DELTA 4-Spindle 17" Drill; power feeds; M.D.

GRINDERS
TAFT-PIERCE No. 1 Precision Surface Grinder; 6 x 12"; tilting head; M.D. (Late).
ARTER Model A-12 Rotary Surface Grinder; 14" chuck; M.D.
BLANCHARD No. 16 Surface Grinder; 26" chuck; M.D.
EXCELLO No. 49 Carbide Grinder; 14" wheels; M.D. (Late).
HAMMOND 14" Carbide Grinder; M.D. (Late).
BROWN & SHARPE No. 5 Plain Cyl. 3 x 18 Grinder; M.D. (Late).

LATHES (Turret)
JONES & LAMSON #4 Univ. Geared Head; bar feed, collets; chuck; lots of tooling; (LIKE NEW).
GISHOLT No. 4 Univ. Geared Head; preselector; M.D. (1942 mfg.).
SIMMONS No. 2 Micro Speed; geared; M.D. (Like New).
FOSTER No. 2B Saddle type; 5" spindle; M.D.; Geared Head; tooling.
WARNER & SWASEY No. 1 Hand Turret Lathes; bar feed; M.D. (1941 mfg.).

MILLS
VAN NORMAN No. 12 Univ. Horiz/Vert. Mill; M.D. (Late).
VAN NORMAN No. 1-18 Production Mill; M.D. (LATE).
KENT-OWENS No. 2-RV Hand Mill; M.D. (LATE).

PRESSES
BLISS No. 103-A Double Crank; str. side gap frame; 2" stroke; bolster 14" x 42"; M.D. (1944 mfg.).
TOLEDO No. 201-E Dbl. Crank Gap Frame Geared; bed 13" x 52"; stroke 3½".
FERRACUTE No. P-2 Flywheel Press; M.D.
FERRACUTE No. P-3 Flywheel Press; M.D.
ZEH & HAHNEMANN No. 7 Embossing Press; 50-Ton cap.; M.D.
EXCELSIOR No. 20 Deep Throat Press; 26" throat; M.D.
RODGERS 150-Ton 4-Post Hydraulic Platen Type; LIKE NEW.

F. W. BURNS MACHINERY CO.
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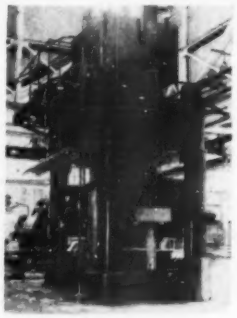
Telephone FRanklin 4-1540

H.P.M. 2500 TON FASTRAVERSE HYDRAULIC PRESS
Age 1943



4 Columns—12" diameter
2 Pull-backs—8" diameter
Stroke 42" (any stroke up to 42")
Daylight 84"
Bed area 72" F to B x 42" L to R between posts in clear
Ram area 72" F to B x 9'7" R. to L.
Bolster, plate 72" x 52"—8" thick
plus additional Bolster, smaller—6" thick.

Diameter of Cylinder approximately 42".
Line pressure operation—2650 lbs. per inch.
Strokes per minute—5
Complete with Pump and G.E. Motor—100 HP 3/60/440 AC
Complete with controls, push-button operation.
Semi-automatic, automatic.
Overall height—24' from floor.
Depth in pit approximately 2'.

In operation. *Immediate Delivery.*

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BLISS No. 5-S Double Action Toggle Draw Press, Bed Area 38"x33", Stroke of Blankholder 10", Stroke of Plunger 21", Air Clutch. New in 1945.
BLISS No. 88 Straight Side Single Crank Press, Bed Area 30"x29", 18" Stroke of Slide, Marquette Air Cushion, 255 ton Capacity.
TOLEDO Double Cranks, Nos. 91-42, 92C, 93½C, 93½E.
CLEVELAND Double Cranks 65-G-72, 45-D-60.
NIAGARA Double Cranks, 67C, 68C, 612C.
BLISS No. 25K Knuckle Joint 600 Ton Capacity.

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Canal 6-2470

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3⅛" FOSDICK HORIZONTAL BORING MILL
108" Spindle to outboard support.

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Brown & Sharpe (1) Model 2G, 1¼" capacity.
Brown & Sharpe (8) Model 0G, ⅜" capacity.
Brown & Sharpe (5) Model 00G, ⅜" capacity.
Brown & Sharpe #4 Automatic New 1939
Ceco Screw Machine ⅜" capacity.
Cleveland Model AA-11, Serial #36586.
Cleveland Model B. Serial #42618/843.
Cleveland B18—1½" Cap. Late.
Conomatic 4 Spindle, Serial #2309FF, 1½".
Davenport 9 16" 5 spindle

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity
Giddings & Lewis #32, 3" #25, 2½" Bar.
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mill

DRILLS AND RADIALS
American 6'x15" Universal, 4'13", 3'9"
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42, RPMSTERS
Canedy-Otto 21" Sliding head, New
Cincinnati Bickford 6'x15" col.
Edlund 8" Model 2B, Sliding Head
Natco #12, 20 spindle Model B2A—10 Sp.
24" Sibley Sliding head
New Geared Box Col. Drills 24"
Foote-Burt #25 3" capacity
Leland Gifford 2 LMS, 3 MS
Leland Gifford No. 2—4 Sp. Hyd. Feeds
Sigourney 2 spindle

ENGRAVERS
Gorton #ME, 1D, 3U, 3Z, Deckel G1L, G1, G2
Taylor-Hobson 3 dimensional Pantograph
New, 3 dimensional Deckel type

GEAR EQUIPMENT
Barber-Colman Mod. SHS, Sharpener
Barbor-Colman #2, #12 (3) also Type S.
Brown & Sharpe #3 Gear Mill, 26" Cap.
Cleveland Rigidhobber Mod. 140.
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner, Flather 72" Cutter
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
Mikron No. 79 Gear Hobbers
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS SURFACE
New 9x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Portman 12" Chuck Rotary—Reid #3, 11"x36"
Pratt & Whitney 12x36" Vertical
Tatt Pierce #1 Precision

HYDRAULIC EQUIPMENT
8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson & Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press
All Hydraulic Equipment is completely engineered and checked by a competent staff thus assuring reliability.
Send us your Hydraulic problems.

GRINDERS, MISCELLANEOUS
Brown & Sharpe #2 Universal 14"x28", #3 Univ.
Brown & Sharpe #5, 3"x18" Cylincrical
Brown & Sharpe #13 Universal Tool & Cutter
Bryant #5 Internal, chucking
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder Mod. 375-2
Heald #73 Internal Centerless, #75A Internal
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread; TG615, Lempco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6-G Drill Grinder, 6G Tool, K.O. Lee tool
Van Norman #666 Crankshaft

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Bertram 26"x10'
Boyes & Emmes—24" G.H.—Bradford 16"x36"
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 14" Yoke
LeBlond Regal 10"x3' bed, 13x42"
LeBlond 25/50x96" Gap, Late type.
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
New 16, 18, 20", 28" Immediate Del.
New Tool Maker 10x24", South Bend 9"
Rivett Model 918 Precision. Mod. 715
Putnam, Sliding Gap 22"/46"x92"
South Bend 13"x5' Q.C.G.
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.
New #2, Univ., Dividing Hd.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2E Plain, No. 2, 3A, 21, #2L
Cinn. 08 Rise & Fall 2-24 Automatic
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens IV, 1-8, 1-14, 1M, 2-20
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2H Universal
Milwaukee #2B, Plain & Univ.
Nichols Horiz. Hand and Pneumatic Feed
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ., Dividing Head
Van Norman No. 12

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, 08 Vertical
Cleveland No. 1 table 8"x32"
Gorton 8D Super Speed
Morey #12M Profiler, 2 sp. #2 Maximiller
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG

PRESSES
Bliss No. 1 Double Action Drawing Presses
Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, Ob
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss S-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, SS, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Horning, 15 Ton—Toledo 32 Ton Honing
Niagara A13¾, O.B.I., Niagara No. 27
Stokes Tablet Presses, type R, Late. Model F
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LI #3
Z & H #4½, O.B.I. 20 Ton

TURRET LATHES
Bardons & Oliver #2, 3, 5, 7. Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Foster #2B 2½ Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—91¼" hole in spindle
Libby 1 HS with threading att.—3R 4R
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, 1A, 2, 2A, 3, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson
Bolt & Pipe Threader: Landis, Oster-Williams
Broach: New 6 Ton. Horizontal. 11 Ton. Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Jig Borers: New Swiss
Keyseater: Davis, Baker
Pipe Bender, Kane & Roach. Parker tube 1½" Cap.
PLANER: Niles-Bement-Pond 36x36'x10'; Gray 24"x24"x8', Detrick & Harvey 40x90"
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13", Tannewitz Cut Off
Scrap Cutters & Granulator: Ball & Jewell

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4" bar Sellers Tble., 96" to outer support
3½" bar Defiance, Table (2)
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DRILL MULTI, No. W-7 Baush, 32 spin., 1947
GRINDER, CYL., 18"x144" Norton, M.D.
LATHES 72"x38' bed N.B.P., blocks to 97"
48"x29' & 24' beds Niles (2)
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39" 61"x23' McCabe, Double Spindle
18"x12' bed L. & S., T.A., M.D.
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Heald #25A Rotary Surface Grinder—Serial #4577 Reconditioned and guaranteed
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Ingersoll Adjustable Rail Planer Type Milling Machine—Serial #3158—Reconditioned and guaranteed
60" Hanchett Face Grinder—Reconditioned and guaranteed
6D Potter & Johnston Automatic Chucking Machine Serial #70193
16" Gould & Eberhardt Shaper—Ser. #66737
24" Bullard Vertical Boring Mill Serial #15000—Reconditioned and guaranteed
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6'15" Col. Cincinnati Bickford Radial Drill Serial #6D-322—Reconditioned and guaranteed.

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Bullard 24", 36" and 54" "Spiral Drive"—Side heads—MD

(NEW) TV-2100—72" table—2 swivel heads and side head—MD

Niles 100"—2 swivel heads—54" under tool holders—MD

Niles 12'—2 swivel heads—148" between uprights—MD

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Pfauter No. 5—Cap. 118" x 22"—Spur, Helical & Worm with attachment for herringbone—MD

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Natco Horizontal Way Type Drill—Mult. Spindle Hydraulic Feed—Model 17U1—Late Type—M.D.

This is one of many Late Type Machines we have available for Sale or trade.

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Greenley, 3 way special, (two)
20" Hammond sensitive drilling and tapping machine
Model D6 Natco multiple spindle tapper

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10 ton, 56", No. 3XA Oilgear
12 ton, No. V2 American vertical
15 ton, 36" Colonial vertical surface
10 ton, 48", No. H10 48 American
18 ton, 42" No. V12 American

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No. 1 Milwaukee vertical, all geared, friction clutch
No. 2B Milwaukee universal, double overarm, power rapid traverse
No. 2 Cincinnati high speed dial type plain, motor in base, 6 way rapid traverse
No. 3K Kearney & Trecker vert., 1943 high speed dial type
No. 3K Kearney & Trecker univ., high speed dial type
No. 36 Van Norman, ram type, 1943, high speed dial type
No. 436 Cincinnati Hydromatic
No. 448 Cincinnati Hydromatic duplex

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Type A & No. 12 Barber Colman
Nos. 1 & 5A Lees Bradner
No. 12H Gould & Eberhardt
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24", No. 3 Farwell hobber
No. 130 Cleveland Rigidhobber
72" Schuchardt & Shutte hob
4" Gleason spiral bevel
No. 13 Gleason gear tester
10" Pratt & Whitney gear grinder
8" & 12" Red Ring gear shavers
24"x12" Flather auto. spur
Cimatool tooth rounders

GRINDERS

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10"x18" Cincinnati Filmatic bearing type ER plain, cylindrical, New 1941 and 1942
10x18 Norton type BA plunge cut
10x36" Norton type B, semi-automatic hydraulic infeed, cylindrical
12"x48" Cincinnati E.R. Universal, Filmatic
20" No. 120A Gardner disc, new in 1947, double spindle
No. 5 Bryant internal, new in 1945
No. 72A3 Heald plain Sizematic & Gagematic
Nos. 16A and 2436, Bryant
8"x24" No. 5B B&S, late model, surface
12"x48" No. 300 Hanchett Vert. Spindle Surface, 1942

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14"x42" Hendey 12 speed toolroom, Motor-in-Base, Late.
24"x14 ft. bed American geared head quick change gears
20"x25" Fay automatic, 1942
12"x24" Lithe Carbo-lathes, late type, 3
2—No. 6 R. K. LeBlond multi-cut manufacturing, 1941
No. 3A Warner & Swasey, serial No. 502273, new in 1943, rapid traverse, Timken bearings, long bed
No. 6 Warner & Swascy geared head motor in base
36" Rogers vertical turret, new in 1942, power rapid traverse
36" Bullard, New Era, rapid traverse, rebuilt

MISCELLANEOUS

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ROD POINTER. Type KK Economy Auto
BORING MILL 3½" Cinni-Gilbert, floor model, 1942
BORING MILL. 4" D. & H. floor type
BORING MILL. 72" H.B.P. vertical
COMPARATOR. 20" Pertman
HONES. Nos. 172 & 2610 Barnes
KEYSEATERS. No. 4 Mitts & Merrill
PLANER. 30"x30"x10' Cincinnati
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7	32-40
8	24-30-32-36-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
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5/32	32-36-40
9/64	36-48
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40

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1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	16-20-24
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1-11/16	10-12-14-16-18-20-24

SIZE	THREAD
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1-7/8	8-10-12-14-16-18-20-24
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SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-48
10	24-30-32-48
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
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SIZE	THREAD
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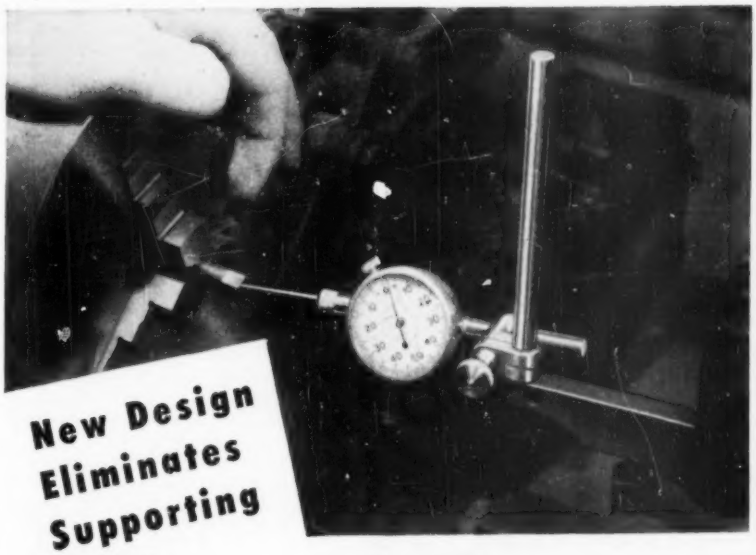

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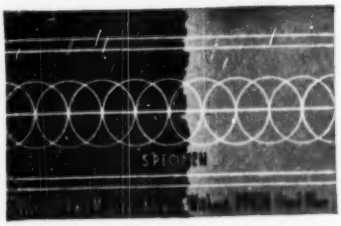

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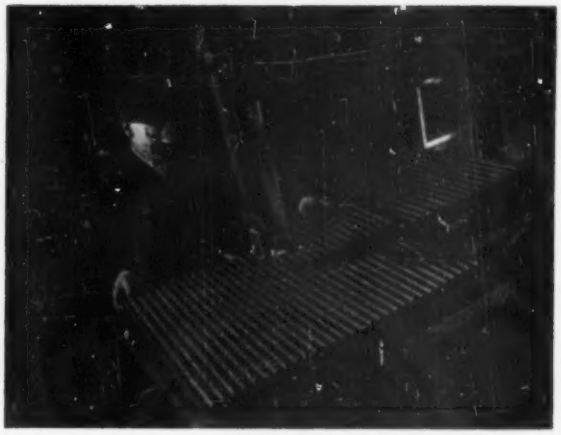

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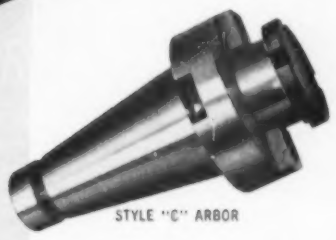

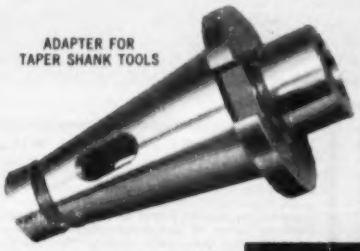

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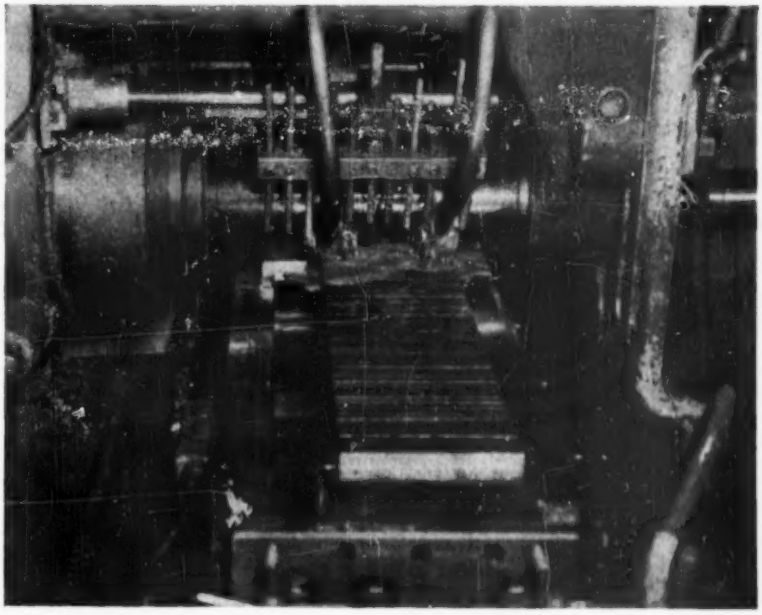

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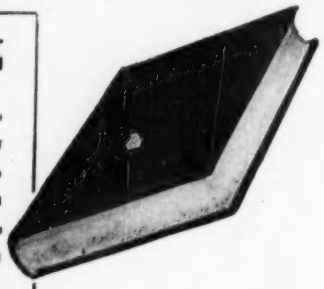

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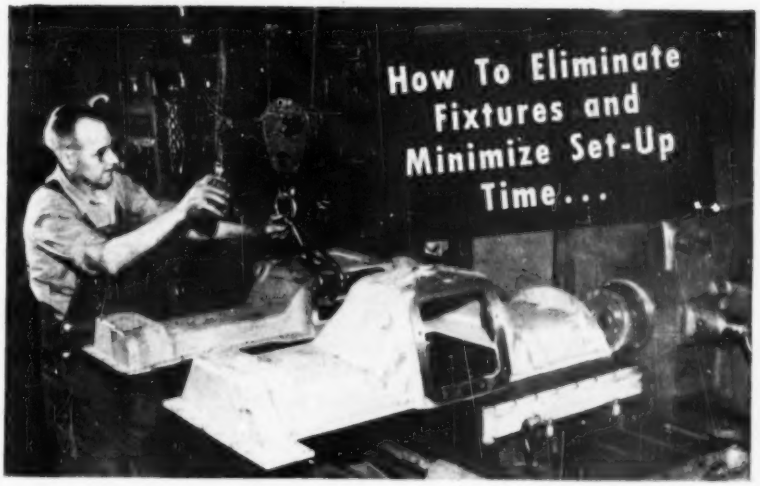

With Sundstrand Magnetic Chucks

Here's how Caterpillar Tractor Co. uses Sundstrand magnetic chucks to eliminate fixtures and cut down set-up time. A pair of chucks are used as a permanent set-up for milling the bell end flange on 26 different oil pans. Prior to installation of the Sundstrand chucks, their pans required 7 different fixtures and from ½ to 1½ hours set-up time. With magnetic chucks, a throw of a switch will secure or release either or both pans instantly. If you have milling or grinding operations in your plant it will pay you to investigate Sundstrand magnetic chucks.

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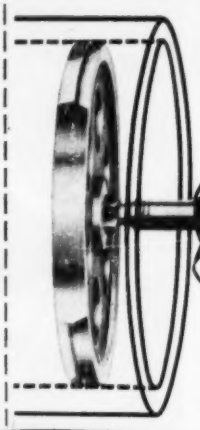

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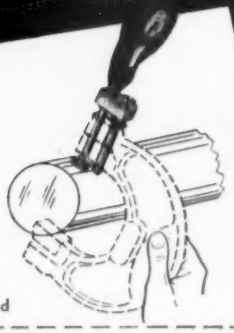

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Comparator (shown here with optional stand), Encased and Decimatic Types

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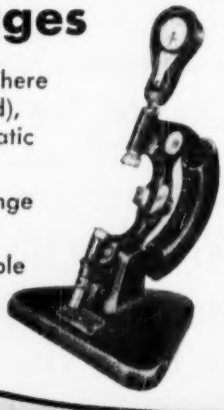

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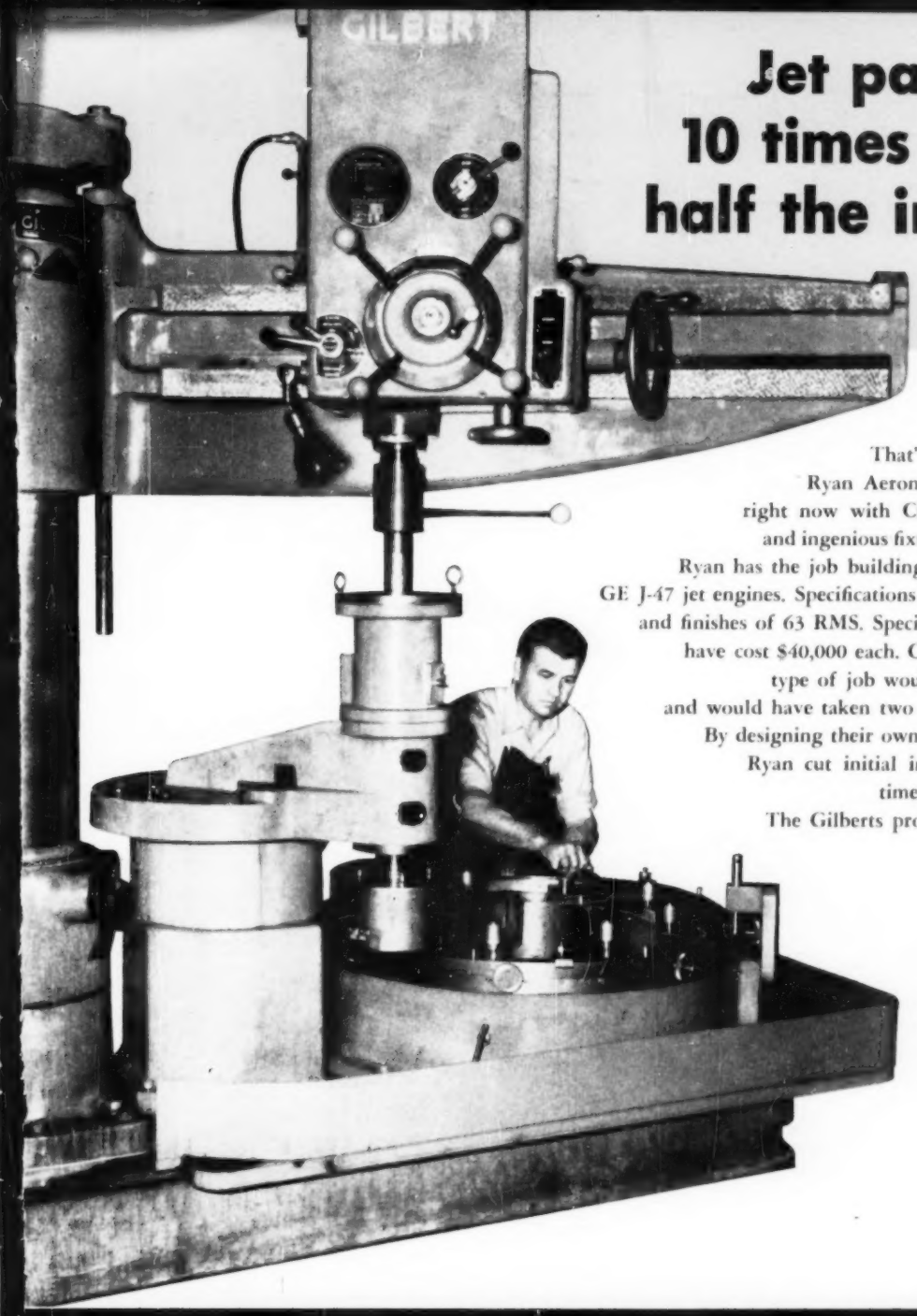

Jet parts drilled 10 times faster for half the investment

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MORE PARTS PER TON OF STEEL

EQUALS

ADVANTAGES OF

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Now manufacturers of ring-shaped tool steel parts can get all the proven advantages of Graph-Mo® steel *plus* the economies of a hollow bar section in Graph-Mo Hollow-Bar—a new graphitic tool steel product in hollow bar form developed by the Timken Company.

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For more information about Graph-Mo Hollow-Bar, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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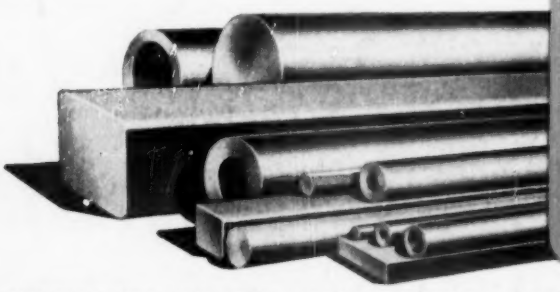

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